A
MATHEMATICAL
COMPENDIUM;
OR,
Uſeful Practices

IN

Arithmetick, Geometry, and Aſtronomy, Geography and Navigation, Embattelling, and Quartering of Armies, Fortification and Gunnery, Gauging and Dyalling.

Explaining the *Logarithms*, with new *Indices*; *Nepair's* Rods or Bones; making of Movements, and the Application of Pendulums; with the Projection of the Sphere for an Univerſal Dyal, *&c.*

By Sir *Jonas Moore* Knight, Late *Surveyor General* of his Majeſties Ordinance.

The Fourth Edition.

LONDON,
Printed for *J. Philips* at the *King's Arms* in St. *Paul's* Church-yard, *H. Rhodes* at the *Star*, the Corner of *Bride-Lane* in *Fleet-ſtreet*, and *J. Taylor* at the *Ship* in St. *Paul's* Church-yard, 1705.

BRITISH MUSEUM

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TO THE
Right Honouroble
GEORGE
Lord *Dartmouth*, &c.

Honour'd SIR,

IT *is now the fourth time that this* Compendium *appears abroad in the world, and though the modeſty of the learned Author ſuf-*

ſered it at firſt to peep out under a borrowed Name, yet the accurate and ſuccinct method of handling ſo uſeful a ſubject, ſpeaks the Treatiſe to be (what I know it was) the work of that ingenious and expert Mathematician, Sir Jonas Moor *Kt. None have a Title, Sir, to own, or to give Reputation to Books of this nature, that within a thin ſhell contain a large Kernel and inſtruct much in few words ; but thoſe who being preferred to publick charges for Learning and Merit, prefer the Publick*

Good before the applauſe of the People: And none, Sir, who know by how indefatigable Studies you have perfected your ſelf in all the parts of Mathematicks, animating the practice of them by the moſt exact Theory, and confirming that Theory by the beſt of practice; can doubt, but that as your extraordinary Worth hath rendred you acceptable to thoſe who are the beſt Judges, and trueſt rewarders of merit; ſo your Loyalty to your Prince, and Love to your Country, are far dearer to you, than any particu-

lar concerns whatſoever can be. You have had skill, Sir, to contrive, and valour on many occaſions, to make practicable both by Sea and Land, many great things in Navigation, Fortification, Art of War, Gunnery, and all the laudable Arts that give glory to a Nation; but the particulars you have atchieved therein, the Publick muſt expect to learn, from thoſe inſpired Pens that ſhall tranſmit the Hiſtory of our Times to future Ages, for I ſhould preſume above my reach to attempt the task. I *beg thereſore pardon, Sir, for the boldneſs I take, in prefixing your Name to this fourth Edition of the Book. It has been already well received in the World, and I am perſwaded that your innate Diſpoſition to encourage all endeavours that tend to publick advantage, will incline you to imprint on its intrinſical value the currant ſtamp of your Patronage and Approbation. As this is the beſt office I could perform in this publication, ſo is it, Sir, the only way I could find to teſtifie my gratitude for thoſe* *many undeſerved favours, you have been generouſly pleaſed to heap ſo liberally upon my Relations and my ſelf, having hereby the honour to profeſs to the World, how much I am, and in all dutifulneſs aſpire to be,*

Your Lorſhips

Moſt Humble,

And Faithful Servant,

R. H.

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This

15

THIS Note, for the ready taking the heig
of the Pole by the height of the Pole-St
ſhould have ended the Book, but want
room, I place it here. Conſider Fig. 23. *wher*
is the North Pole, ZPN *the Meridian, the Ci*
Z d N b *the Circle the Pole* ✳ *makes about*
Pole, Z *the Pole* ✳ *above,* N *under the P*
d *the Pole* ✳ *in any Quarter of the Cir*
PZ *or* PN *is the* Radius = *this Year* 1674
2° 25′ 59″, *or* 8759″, *and for every Year*
come ſubſtracting 20″, *it will be* 1675 = 8
1676 = 8719, &c. *Next thing to know, is*
Right Aſcenſion of the Pole ✳, *which this Y*
will be 9° 12′ 46″ *at* Z, *at every Year*
ding 1′ 54″ *to the former, makes it t*
1675 = 9° 14′ 40″, 1676 = 9° 16′ 34′,
which muſt be turned into Time, allowing ev
Degree 4′, &c. *Subſtract the* ☉ *Right Aſ*
ſion from Pole ✳ *Right Aſcenſion, leaves*
time of the Pole ✳ *Right Aſcenſion at* Z *ab*
the Pole, and adding 12 *hours at* N *under.*

Now by a true Pendulum Watch, *at any ti*
when you would find the Latitude, having
time of the Night, take the Difference betw
the Pole ✳ *Right Aſcenſion at* Z, *and t*
time, and turning that into Degrees, Minu
and Seconds, it ſhews in what part of the Ci
the Pole ✳ *is, and in what Quadrant,*
the ∠ at P. *Laſtly, Add the Logarithms*

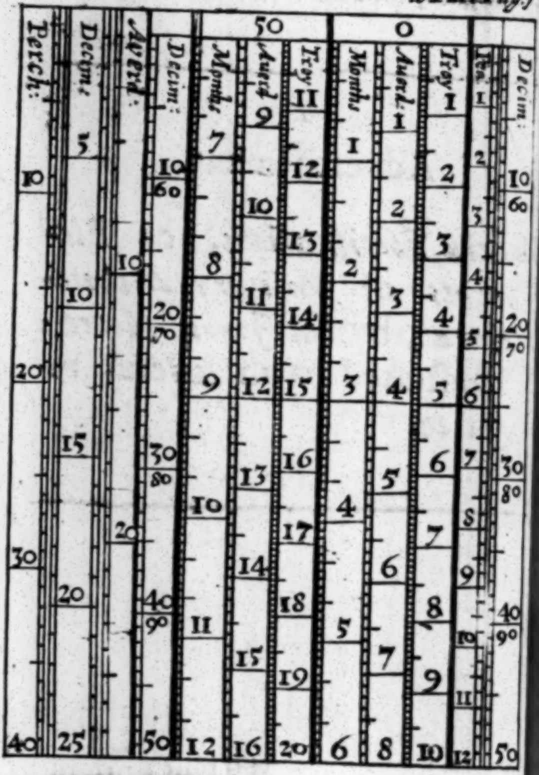
e Coſine d B o, *and* d B, *or* P z, *and ſub-*
act the Radius, it gives the Logarithm of
. *Now the height of the Pole* ✝ *leſs or more*
. = *height of the Pole.*

Advertiſement.

odern Fortifications, or *Elements* of *Military Architecture*; by Sir *Jonas Moore*: Illuſtrated with ſeveral Figures.

Decimal

Decimall Tables *to Face Pag: 1*


Perch: 10 20 30 40
Decim: 5 10 15 20 25
Averd: 10 20
Decim: 10 60 20 70 30 80 40 90 50
50
Months 7 8 9 10 11 12
Averd 9 10 11 12 13 14 15 16
Troy 11 12 13 14 15 16 17 18 19 20
0
Months 1 2 3 4 5 6
Averd: 1 2 3 4 5 6 7 8
Troy 1 2 3 4 5 6 7 8 9 10
Pen: 1 2 3 4 5 6 7 8 9 10 11 12
Decim: 10 60 20 70 30 80 40 90 50

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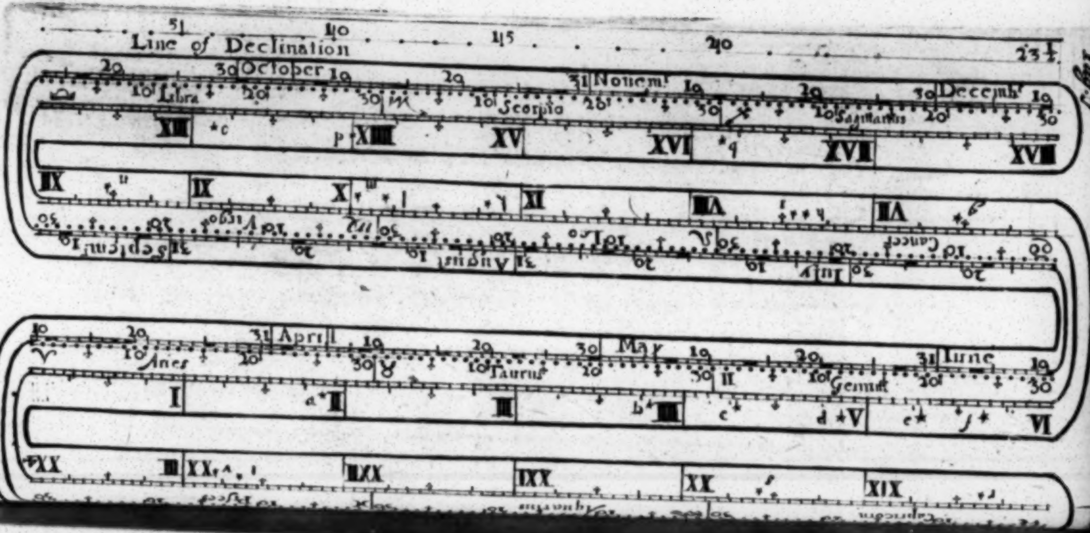

Line of Declination
51
40
45
20
23½
October
Novem.
Decemb.
Libra
Scorpio
Sagittarius
Septem.
August
July
Virgo
Leo
Cancer
Aprill
May
Iune
Aries
Taurus
Gemini
Capricorn
Aquarius
Pisces
XIII
XIIII
XV
XVI
XVII
XVIII
IIX
IX
X
XI
VII
VIII
I
II
III
IIII
V
VI
XX
XXI
XXII
XXIII
XIX

CHAP. I.

Of a Perpetual KALENDAR OR ALMANACK.

The Uſes of three ſmall *Tables* for finding the Days of the Month, Sun's place, Right Aſcenſion, the Prime, Epact, Moon, Tides, Stars, &c. for Ever.

The firſt Table or Figure.

This Table begins the firſt of *January*, and contains the days of the Year; the firſt of *January* is made black, and ſo every ſeventh until the years end; there runs along in another Line the place of the Sun anſwering and oppoſite to the Days, (*viz.*) every degree of the Ecliptick from ♈ to ♓ through the whole Ecliptick, and near to this laſt Line, there runs a Line expreſſing the right Aſcenſion of the Sun or Star anſwering unto 24 hours; each hour is divided into 15 parts; which are four minutes a piece; near it are placed ſmall Aſteriſms with Letters by them for 20 of the principal Stars ſet down in the Third Table.

The Second Table or Figure.

This Table, Entituled an Almanack for 14 Years, has in the middle Dominical Letters, a the ſeven backward from A to B, above which are years paſt, and below years to come, with the Prime or Golden Number under the Years, and the Cycle of the Sun below. Theſe Years are expreſt by 2 Figures, and ſometimes by one; and are all the Leap years that are betwixt the Year 1600 and 1740; by explaining the lower row you will eaſily perceive all. In one Line there is 1660 begins, 1672. 1656. 1668. 161 1664. and 1676. follow, all which are Leap-years, and has to each Year the Dominical Letter above and Prime below, and thoſe intermediate Years that are not Leap-years are to be ſupplied. Suppoſe I begin at 1660, which hath G for Dom. Letter, and Prime 8; for 1661 it will have F for Dom. Let. and 9. for Prime, and is ſuppoſed to ſtand in the room of (72) For 1662 inſtead of (56) 1663 inſtead of (68) 1664 inſtead of (80) and then 1664; ſo that

Leap

c.1.

An ALMANACK for 140 yeers

Ian :	
Circumcis:	1
Epiphanie	6
Hil: Ter: be:	23
Car: 1 Mart	30
Feb :	
Puri: Mary	2
*Shro: Tusd:	2
Hil: Ter: en:	13
Vallentine	14
St Mathias	24
Mar :	
David Arch:	1
*East: ☉ day	25
Lady day	25
Apr :	
*East: Ter: be:	7
St George	23
St Mark	25
*Ascention d.	29
May :	
St Phil: & Iac	1
*East: Ter: en	3
*Whit: ☉ day	9
Car 2 nat:	
*Trinity T: be	25
Iun :	
*Trinity T: en	9
St Iohn Bap:	24
St Peter ap:	29
Iul :	
St Iames ap	25
Aug :	
Lamas	1
St Barthol:	2

Yeers past	y	4	16	600	12	24	8	20
	p	9	2	5	17	10	13	6
	y	32	44	28	40	52	36	48
	p	18	11	14	7	19	3	15
Do:k		G	F	E	D	C	B	A
yeers to come	y	60	72	56	68	80	64	76
	p	8	1	4	16	9	12	5
	y	88	700	84	96	8	92	4
	p	17	10	13	6	18	2	14
	y	16	28	12	24	36	20	32
	p	7	19	3	15	7	11	4
[illegible]		17	1	13	25	9	21	5

Sep :	
Ex: ✝	14
St Mathew	21
St Mich: ar:	20
Oct :	
St Luke	18
Mich: T: be:	2
Simō & Iud	28
Nou :	
All Saints	1
Mich: T: en	28
St Andrew	30
Dec :	
St Thomas	21
Nat: Christi	

Leap.

Leap-year is twice accounted, one for that pa of the Year, from the beginning of *January* the end of *February*, the latter for the oth part of the Year,and has two Dom Letters.Fu ther, 1672 is in the Table, but this prese Year 1674 is not there, but imagined to sta in the place of 1688, and has D for the Do Letter, and 3 for the Prime, accounting fro the laſt Leap-year 1. On either ſide of the la Oblong are the Months in order, with the Fe ſtivals, Terms, and Notable Days in ea Month, when they fall upon. The moveab Feaſts are marked with a ſmall ſtar, as in F *bruary* Shrove-Tueſday, and in *March* Eaſte Sunday, and have a day ſet to them, to whi every Year another number being added mak them certain.

The Third Table or Figure.

This Table has on the left hand in four ſm Columns, (1) The Prime expreſſed by Poi and Figures down to 19; (2) the Epact a ſwering to the Prime; (3) the Dominical Le ter; (4) A number anſwering, which ſerves f aſcertaining the Moveable Feaſts. Next the fo mer,are the Names and Declinations of twen principal fixed Stars,with the Letters of the A phabet, to direct where theſe Stars are to found in the 1 Table for their right Aſcenſion and the fourth Column ſhews whether their D clinations be North or South. The laſt thing this Table obſervable, is, the New Moons Changes: It has 13 Columns; the firſt are t Year of the Lord, every Tenth Year expreſſe from the 0 which ſignifies 1600,and ſo you w find all the figures that ſtand right,which are 2, 3, 4, 5, 6, 7, 8, 9, ſtand for 1610, 1620, & Then △ ſtands for 1700;and ſo the figures sta dow downwards 'till 1690, which is for 200 years, the intermediate years to be ſupplied as was done in the Second Figure, for the Years betwixt Leap-years.

a	♈ head	21	45	n
b	Whale	02	48	n
c	Buls eye	15	48	n
d	Goate ſtarr	45	47	n
e	Hum: Orion	06	01	n
f	Hum: Orion	07	18	n
g	Great Dog	16	14	s
h	Leſſer Dog	06	03	n
i	♊ head	28	46	n
k	Cor Hidræ	07	15	s
l	Cor ♌	13	33	n
m	Lumb ♌	22	20	n
n	♌ Taile	16	25	n
o	Virgi: Spike	09	31	s
p	Arcturus	20	58	n
q	♏ hart	25	37	s
r	Harp ſtar	38	50	n
s	Vulture	08	03	n
t	Fomahant	13	22	n
u	Peg: Wing	13	28	n

30 1	16
29 2	17
28 3	18
27 4	19
26 5	20
25 6	21
24 7	22
23 8	23
22 9	24
21 10	25
20 11	26
19 12	27
18 13	28
17 14	29
16 15	30

12 IIII	12 IIII
1 V	1 V
2 VI	2 VI
3 VII	3 VII
4 VIII	4 VIII
5 IX	5 IX
6 X	6 X
7 XI	7 XI
8 XII	8 XII
9 I	9 I
10 II	10 II
11 III	11 III

Years	Ian	Feb	Mar	Apr	May	Iun	Iul	Aug	Sep	Oct	Nov	Dec
9	6	5	6	5	5	3	1	0	8	8	6	6
8	5	3	5	4	3	2	1	0	8	8	6	6
1	4	2	4	3	2	1	1	9	8	7	5	5
3	3	2	3	2	1	9	8	7	6	5	4	3
5	1	0	1	0	9	8	7	6	5	4	3	2
7	1	0	1	9	9	7	7	5	4	3	2	1
9	0	8	0	9	8	6	4	4	3	2	1	1
1	9	7	8	7	6	5	4	3	1	1	0	9
3	8	7	8	7	6	4	4	1	0	0	8	8
5	7	6	7	6	6	3	3	1	9	9	7	7
7	6	5	5	4	4	2	1	9	8	7	6	5
0	4	3	4	3	3	0	0	9	7	6	5	4
2	3	2	3	2	2	0	0	8	7	7	4	4
4	2	1	2	1	0	9	9	9	6	6	4	4
6	1	9	0	9	8	7	6	5	4	4	3	2
8	0	9	0	8	8	6	6	4	3	3	1	1
0	0	8	0	8	7	6	5	4	2	1	0	0
2	9	7	9	7	6	5	4	2	1	0	9	9
4	7	6	7	6	5	3	3	1	9	9	7	7

11	D	15
22	G	4
3	E	23
14	A	12
25	D	1
6	B	20
17	E	9
28	C	28
9	F	17
20	B	6
1	G	25
12	C	14
23	F	3
4	D	22
15	G	11
26	C	0
7	A	19
18	D	8
29	B	27

The Columns under the 12 Months exp
the day of the mean Change of the Moon ev
Month, if the Figure ſtand right; that is, w
its head up, it ſtands ſingly for ſo much; i
ſtand with its head to the right hand, it ſign
10, and ſo many days beſides; if towards
left hand, then 20 and above; if downwa
then 30 and above.

The particular uſe of the three Tables af
ſaid.

Uſe. 1. To find the Prime, Dom. Let.
Cycle of the Sun for any year propoſed.

Example, 1674 I find in Tab. 2. among
years 72 laſt Leap-year; I tell on 1673,
where (68) ſtands, D is the Dominical Let
3 the Golden Number (by accounting from
under (72) and 3 the ⊙ Cycle. Again, if 16
were propoſed, G and A the Dom. Let. 5
Prime, and 5 ⊙ Cycle.

2. To find the Epact, in the third Table
der the title of Epacts againſt the Prime
gainſt 3 the Prime, the Epact is 3, again
Epact 25.

3. To find what day the year begins on,
cauſe A is always the firſt of *January*, if that
the Dominical Letter, then it is Sunday; if
other, as in the year 1674 D, tell back to A
D Sunday, C Saturday, B Friday, A Thurſd
All the black days in (Table 1) are Thurſd
that year; and having the Thurſdays, the
are had: And thus you may find whether
Leaſe or Bond be right dated, and what day
the Week any day will fall on that is to com

4. (Table 1) againſt the day of the week
may find the place of the Sun, and the ri
Aſcenſion; as againſt the 25th of *March*, the
degree of *Aries* ſtands, and the right Aſcenſ
1 h. and 8.

5. The (2 Table) amongſt the Months the

the Feſtivals and Terms, if they be fixt; but for the Moveable that have a Star adjoyned, you muſt find how many days muſt be added each year to them to make them fixt, ſuppoſe 1674, 3 is the Prime, and D the Dom. Let. againſt 3 the Prime in the (3 Table) you have E the Dom. Let. and 23 a number; now tell how far diſtant E is from D forwards, *viz.* 6, which 6 added to 23, makes 29 to be added to the number againſt all the Moveable Feaſts, to make them fixt for this year; *viz.* Shrove Tueſday being found on the ſecond of *February*, add 29, makes it the third of *March*, and Eaſter day the 19th of *April*.

6. For the twenty Stars, if any of theſe named come into the Meridian, or to any known hour of the night, find the Star in the (3 Table) and obſerve the Letter that anſwers; ſeek that Letter in the firſt Table, and find what right Aſcenſion it hath; take the Sun's right Aſcenſion from it, (but if it be leſs, add 24 hours) and the difference in time added to the Star's hour gives the true time of the night.

7. To find what day the Moon changeth each Month, as in the year 1673, look in the (3 Table) againſt 7 account 1670, tell down, 71, 72, 73, (that is, where E, ſtands downwards) it changeth in *January* the 8th day, in *February* 7, *March* 8, *&c.* (this is meant of the mean Change) If when you have got the day of the Change you place that in the Kalendar (Table 1) you may find the Moon's age any day.

8. To find the time of high water at *London-Bridge*, you muſt very well obſerve the Column for the Moons Motion and Tides in Table 3 where firſt you have ſmall figures going down to 15 in one line, and from 16 to 30 in another, being the Moons Age for the Tides, which are had by inſpection in the two annext lines divided into hours and fifth parts, and marked with the

Numerical Letters, (the ſmall figures in mix'd, being for the time of the Moon's ſ ning.) As for Example, ☽ 8 days old, i high water at 9 h. and 24 minutes; at 22 d old at 8 h. and 36′.

9. To find the length of the Moon's ſhinin Here the Age of the Moon is accounted do in the firſt Column to 15, and up againto 3 the ſame, and the time is expreſſed by t ſmall figures amongſt the Numeral. As at days old the ſhinning is 6 h. and 24′. at days 4 h. 48′.

10. For the Moons Riſing and Setting t this Rule,

Increaſ. { ☉ riſing more ☾ ſhining = ☽ riſ
{ ☉ ſetting more ☽ ſhining = ☽ ſ

Decreaſ. { ☉ riſing leſs ☽ ſhining o riſing
{ ☉ ſetting leſs ☽ ſhining = ſettin

11. To find the time of the night by Moons ſhining on any Dyal; firſt, the Ti are three hours more than the ☽ Southing therwiſe.

☽ Southing leſs by the ſhadowed hour = Time in the Eaſt.

☽ Southing more by the ſhadowed hour Time in the Weſt.

12. Theſe proportions are all near true, b not abſolute, becauſe they reſpect only the me Motion, having not regard to the ☽ Latitu Without this Book may be had all the three T bles printed together to uſe alone.

C HA

CHAP. II.

Of Weights and Meaſures. Of Metals, Water, &c. and other uſeful Notions.

1. *Meaſures of Application or Length are denominated from the parts of the Body, but are indeed in* England *taken from the Yard Standard kept in* Guild Hall, *the third part is a Foot, and the 36 part an Inch; expreſſed in this Table from an Inch to a Mile.*

Table of Square Measures.

Acres	4	160	17429	4840	43560	Pag 9
	Rood	40	4356	1210	10890	
		Pole	1089	30 1/4	272 1/4	39204
			Pace	227	25	36000
				Yard	9	1296.
					Feet.	144
						Inch

Table of Long Measures.

Inch.											
3	Palm.										
9	3	Span.									
12	4	1 1/3	Foot.								
18	6	2	1 1/2	Cubitt.							
36	12	4	3	2	Yard						
45	15	5	3 3/4	2 1/2	1 1/4	Ells.					
60	20	6 2/3	5	3 1/3	1 2/3	1 1/4	Pace.				
72	24	8	6	4	2	1 3/4	1 1/5	Faddom.			
198	66	22	16 1/2	11	5 1/2	4 2/5	3 1/10	2 3/4	Poole		
7920	2640	880	660	440	220	176	132	110	40	Furlong.	
63360	21120	7040	5280	3520	1760	1408	1056	880	320	8	Mile.

Turn the ſide to you, and then this Table o long Meaſures, (as all the reſt after) may b conſidered as to the Colums or Spaces betwi line and line from top to bottom; or linear, o by lines from the left to the right. The Colum is of the ſame name as at the top; ſuppoſe inche 3, 9, 12, 18, *&c.* are all inches: But in the lin do ſeverally belong to the name at the end o the line; as 36 Inches, 12 Palms, 4 Spans, Feet, 2 Cubits make ſeverally a Yard.

Square Meaſures or Superficial are containe in the other part; as, one Pole ſquare ar 1089 ſquare Paces, $30\frac{1}{4}$ ſquare Yards 272 ſquare Feet 39204 ſquare Inches. In the Tabl of long Meaſure it is ſaid a Pole or Perch i $16\frac{1}{2}$ Feet, which is the State Perch; beſide which there are other cuſtomary Perches o Poles, *viz.* 18 Feet for Fens and Wood-land 21 for Foreſts, *Lancaſhire* and *Iriſh* Meaſur and $18\frac{3}{4}$ *Scotch.*

The Meaſure for Horſes is by the handful = 4 Inches.

How theſe Meaſures of ours agree with othe abroad, ſee a Table Printed in Modern Fortifications; and at the latter end of this Book.

The Ell is five quarters of a Yard, and has 2 Nevles; as a Yard has 16; $\frac{1}{5}$ of an Ell = $\frac{1}{4}$ o a Yard. A *Dutch* Ell or Stick is three quarter of a Yard, by which Tapeſtry is meaſured.

2. Before we come to Meaſures of Applicat-on, which depend much upon Weights, we wi treat of Troy and Averdupois weight: By Tro weight, Gold, Silver, Jewels, Amber, Electu-ries, Bread-Corn, Liquors, are weighed; an from this Troy Pound are taken all Meaſure for wet and dry Commodities.

Averdupois weight weighs all manner o

c.2

things that can waite, and though the Pound Averd. be greater than the Pound Troy, yet the Ounce is leſs. The Pound Troy is divided into Ounces, Peny-weights, Grains, &c. and the Pound Averd. into Ounces ℥, Drams ʒ, Scruples ℈, Grains Gr. The Tables follow.

Troy Weight.

Grains.			
24	Pen.wt.		
280	20	Ounce.	
5700	240	12	℔

Apoth. Weight.

Gr.				
20	℈			
60	3	ʒ		
480	24	8	℥	
5760	288	96	12	℔

Apothecaries make up their Medicines by the laſt Table of Troy weight, but buy and ſell Drugs by Averd.

Averd. Weight.

Scruples.	Drams.				
3					
24	8	Ounce.			
18	121	16	pound.		
43008	14336	1792	112	Hund.	
860160	286720	35842	2240	20	Tun.

H

The great Hundred is always 112 l. and 20 of theſe make a Tun. Eighry Ounces Averd. make near 73 Ounces Troy; which is 5 l. Averd. to 6 l. Troy, which ſhews the Ounces Averd. leſſer, and the l. Averd. greater than the Ounces or l. Troy.

Dr. *Wiberd*, who was very diligent, makes 14 l. Averd. equal to 17 l. Troy; therefore let this proportion hold;
{ Troy l. to Averd l. 17. 14.
{ Troy ou. to Av. ou 51. 56.

And

And by very good Experiments of him and others, it will be very uſeful to know, that one Ounce of pure running or rain water Troy will fill 1,8949 inch, and 1 oun. Aver. 1,72556 inch. One l. Troy will fill 22,7368 ſolid inches, and 1 l. Averd. 27,609. One ſolid Foot will hold 76 l. Troy, and 62,588 Averd.

A Tun weight Averd. is always 20 C of all things, except Lead, which is 19 C. and a half. Allum, Cinnamon, Nutmegs, Pepper and Sugar has 13½ l. to the Stone, and 108 l. to the C. *Eſſex* Cheeſe or Butter the Clove is 8 l. the Wey 32 Cloves, or 256 l. In *Suffolk* the Clove is 8 l. the Wey 42 Cloves, or 336 l. Hay ſhould have 20 C. but is ſold for 18 C. 36 Truſſes, or 2016 l. Wooll is ſold by the Clove, or half Stone 7 l. by the Stone 14 l. Tod 28 l. Wey 182 l. Sack 364 l. Laſt 4368 l. Iron and Shot are weighed 14 l. to the Stone, 28 l. to the Quarter, 112 l. to the C. 20 C. to the Tun. A Faggot of Steel is 120 l.; a Burthen of Gad-Steel is 2 ſcore, or 180 l. For the weight of Butter and Sope, 56 l. of Butter, and 60 l. of Sope make a Firkin, and four Firkins a Barrel of either.

3. *Dry Meaſures* of Capacity are raiſed from the Gallon, containing 8 Pints, which ſhould be contained in 272¼ Cubick Inches, and ſhould hold of pure running or rain water 9 l. 13 oun. 12 dr. ½ of Averd. Weight. Therefore to come to a true Gallon for dry meaſure, if you make a ſquare Veſſel that ſhall have each ſide 6 inches and 48 hundred parts of an inch, or if you weigh with Averd. weights, 9 l. 13 oun. and 12 drams of clean rain or running water, either of theſe will find out a Gallon dry Meaſure.

Corn

c. 2.

Corn Meaſure.

	Pints	Gal	Peck	Buſh	Strik.	Carnock or coomb. or Sack	Seam, raf or quarter	Wey	Laſt.
	8								
	16	2							
	64	8	4						
	128	16	8	2					
	256	32	16	4	2				
	512	64	32	8	4	2			
	3072	384	192	48	24	12	6		
	5120	640	320	80	40	20	10	10	
A	1 l	8½	17	68	136	276	542	3072	5120
B	140	7 l.	17	56	1C.	2C.	4C.	24C	40 C.

The number in the Line A expreſſeth in ounds Troy the weight of Wheat in all the leaſures, in B Averd weight.

Meal is weighed as Corn, but the Common epute is, that a Gallon of wheaten Meal weighs 7 l. Averd, and 8 l. 6 ou. 4 d. weight Troy; and o a Buſhel 56 l. Averd. and 68 l. 1 ounce, 12 enny weight Troy. All other Grain, likewiſe alt, Lime, Coles, &c. follow this meaſure, hich is called *Wincheſter* meaſure: But note, hat as Sea-Cole and Salt are meaſured with this uſhel, then they are heaped, or elſe there is llowed five ſtriked Pecks to the Buſhel; and his is called Water-meaſure; 36 ſuch Buſhels re a Chaldron of Coles; and on Ship board hey allow 21 Chaldron to the Score.

4. Liquid meaſure is either Wine, or Ale and eer meaſure. The Gallon for Wine meaſure ontains 231 Cubical inches, and ſhould hold of ure rain or running water, 8 l. 1 oun. 11 dr.

Averd.

Averd. and 9 l. 10 Oun. 1¼d Troy ; Therefo
to get a true Win: Gallon, make a ſquare veſ
that ſhall have all the ſquares and depth 6 Inch
and 13 hundred parts of an inch, or if you weig
with Averd. weigh 8 l. 1 Oun. 11 dr. of pu
running water; either of theſe will find out
true Gallon of Wine meaſure.

A Table for Wine Meaſure.

A Tun of Wine weighing Averd. 17 C. weight.
One Pint 1 l. 0½ Ounces Troy.

Pints								
8	Gall.							
144	18	Rundiets						
252	31½	1	Barrels					
336	42	2⅓	1⅓	Terce				
504	63	3½	2	1½	Hogſheads			
672	84	4⅔	2⅔	2	1⅓	Puntions		
1008	126	7	4	3	2	1½	Buts	
2016	256	14	4	6	4	3	2	Tun

5. The Gallon for Ale or Beer holds 282
lid inches, and weighs of pure water 10 l. 3
|4.26, Therefore the ſquare Veſſel ought to
6 inches and 55 hundred parts of an inch e
way, and the water 10 l. 3 oun. |42 Averd
find this Gallon.

A T

A Table for Beer.

Pints					
8	Gall.				
72	9	Firk.			
144	18	2	Kild.		
288	36	4	2	Barrels	
576	72	8	4	2	Hogſh.

Ale.

Pints					
8	Gall				
64	8	Firk.			
128	16	2	Kild.		
256	32	4	2	Barrels	
512	64	8	4	2	Hogſh.

Note that Veſels for Butter, Fiſh, Sope, follow the Ale meaſure of a Gallon; 8 Gallons make a Firkin, 2 Firkins a Kilderkin, 2 Kilderkins an Ale Barrel, and 12 Ale Barrels a Laſt.

6. Tale and number of ſeveral goods.

Of Canvas cloth, the C. is 120 Ells; of Fuſtion 1 Chef is 14 Ells; of fine Linnen, Silk, and Syndon, 10 Ells.

Codfiſh, Haberdine, Ling, &c. have 124 to the C and 1240 to the M. Eels 25 to the ſtrike, and 10 ſtrike to the Bind. Of Herring 120 to the C. 12 C. to the M. laid in a Barrel, and 12 Barrels to a Laſt.

Tale of Furrs, Filches, Grayes, Jennets, Martins, Mincks, Sables, 40 Skins is a timber: other Skins 5 ſcore to the C.

A Seam of Glaſs is 24 ſtone, or 120 l.

One Bale of Paper is 10 Ream, a Ream i Quire, a Quire 25 ſheets.

One Rowl of Parchment is 5 dozen, a doze 12 Skins.

Ten Hides are a Dicker, a Laſt 20 Dikers.

Ten pair of Gloves a Dicker; and ſo te Hors-ſhoes.

Tale of Fuel. All Biliets ſhould be 3 Fo long, and ſo all Faggots; and the band beſid the knot 24 inches round, and not flat.

A Laſt of Powder is 24 Barrels or Firkin which muſt hold a 100 l. neat.

Timber is ſold either by the Tun or Load; Tun is 40 Foot ſolid, a Load is 50 Foot ſolid.

7. Of Gold and Silver. They are near th proportion of 12 to 1; therefore if an Hebre Talent of Silver be valued at 375 l. that of Gol will be 4500 l.

The value of Gold here in *England* is as fo lows. One peny weight of Angel Gold is wort 4 s. 2 d. ob. of Crown Gold 3 s. 10 d. ob. of So vereign 3 s. 6 d. ob.

One pound ſterling money ought to have 1 ounces 2 penny weight fine Silver, and 18 pen weight Allay.

Fineneſs of Gold is eſteemed by the Karract no certain weight, but the $\frac{1}{24}$ of any quantity This Karract is divided into Grains and Parts.

The Karract that weighs Jewels is divide into 4 gr. of which grains 20 make 24 gr. Troy, or 1 peny-weight.

8. Metals, Stone, Liquors, Grain, &c. ar compared as in the Table following; wher there are four Columns; the firſt contains th names of them; the ſecond Column A has the weights in Troy Ounces anſwering to a Cubic inch of Magnitude; the third Column B ha their Magnitude in inches and Decimal parts, an ſwering to one Oun. of Troy weight; the thi Colum

c·2·

Column C. is the weight of a Cubick inch in the water, in Troy ounces and Decimal parts.

	Ou. A.	inch.	B. C.
☉ Gold. ———	9.91735	0.10083	9.33962
☿ Quickſilver —	7.93388	0.12604	7.35615
♄ Lead. ———	6.16198	0.16229	5.58425
☾ Silver ———	5.50083	0.18179	4.92310
♀ Copper — —	4.81342	0.26776	4.23569
♂ Hamer'd Iron	4.27715	0.23360	3.69942
Caſt Iron. ———	3.96821	0.25253	3.09048
♃ Tin— ———	3.96694	0.25208	3.38921
Marble. — — —	1.59631	0.62644	1.01858
Common Stone-	1.09835	0.91045	0.50062
Honey.— — —	0.79339	1.26042	0.21566
Salt water.— —	0.57773	1.79490	0.00000
Freſh wa. or wine	0.52773	1.77490	
Oyl— — — —	0.47603	2.10069	
Wheat.— — —	0.37628	2.65757	
Dried Oak — —	0.40745	2.45609	

The uſes of theſe Tables will appear hereafter in the Rules of Practice

		li.	s.
Troy wt. 1 l. ſover. Gold	is worth	42	10
Averd. wt. ſover. Gold	is worth	51	$14\frac{3}{8}$

So that 100l. in Crown gold weighs only 1 l. 12 ou. and 100l in ſilv. money will weigh 261.9 ou. Av.

You may find by the former Rule and Tables, that one cannot well be cheated by the bulk of gold and other metals, by reaſon of the weights.

To end this Chap. I have added the Aſſize of Bread in Averd. weight; a very uſeful Table to correct Bakers; the Town-Bakers Prizes being on one ſide, Foreigners on the other; the Table in it ſelf will be information ſufficient. The Officers in towns, and Juſtices of Peace in the contry ought to obſerve theſe Rules: On the right ſide and left there is ſet down the price of a buſhel of wheat, and if the Bakers want 1 ounce in 36, to ſuffer the Pillory.

TheAſſize forBread for all Weig

Free Town. Bakers.		Weight of a Peny Loaf.											
		Troy						Averd.					
s.	d.	white		wh.		hou.		white		wh.		hou.	
2	0	16	13	25	4	33	11	15	7	23	1	30	15
2	3	15	17	25	3	30	14	19	2	21	3	28	4
2	6	14	4	21	6	28	8	14	0	19	10	26	0
2	9	13	3	19	13	26	7	12	1	18	2	24	3
3	0	12	5	18	8	14	11	11	5	16	18	22	11
3	3	11	9	17	6	23	3	10	11	15	17	21	3
3	6	10	14	16	5	21	13	9	19	14	18	19	18
3	9	10	5	15	7	20	9	9	8	14	2	18	16
4	0	9	12	14	10	19	8	8	10	13	7	17	16
4	3	9	4	13	14	18	8	8	9	12	13	16	18
4	6	8	13	13	4	17	10	8	1	12	1	16	2
4	9	8	7	12	10	16	14	7	13	11	10	15	7
5	0	8	1	12	1	16	2	7	7	11	0	14	14
5	3	7	11	11	9	15	7	7	1	10	11	14	2
5	6	7	6	11	2	14	13	6	15	10	3	13	10
5	9	7	2	10	11	14	4	6	10	9	15	13	0
6	0	6	14	10	4	13	11	6	5	9	8	12	10
6	3	6	10	9	15	13	4	6	0	9	1	12	1
6	6	6	6	9	9	12	12	5	16	8	15	11	13
6	9	6	3	9	4	12	6	5	12	8	9	11	5
7	0	5	15	8	15	11	15	5	9	8	3	10	18
7	3	5	12	8	11	11	9	5	5	7	18	10	11
7	6	5	9	8	1	11	3	5	2	7	13	10	5
7	9	5	7	8	3	10	14	4	19	7	9	9	19
8	0	5	4	7	15	10	9	4	16	7	5	9	12
8	3	5	2	7	12	10	5	4	14	7	1	9	8
8	6	5	0	7	8	10	0	4	11	6	17	9	2
8	9	4	14	7	5	9	12	4	9	6	13	8	18
0	0	4	12	7	2	9	8	4	6	6	10	8	12

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CHAP. III.

OF ARITHMETICK

And its PARTS;

And of the moſt eaſie performance of Multiplication, Diviſion, and Extraction of the Roots by Nepayre's *Rods: The uſe of the Table of Logarithms herewith Printed: Decimal Tables, Progreſſion and Proportions.*

§1. OF the ſix principal Parts; Numeration, Addition, Subſtraction, Multiplication, Diviſion and Extraction of the Roots; but firſt notice muſt be taken of theſe few Characters.

+ Addition or more
— Subſtraction or leſs
X Multiplied by
= Equal to

Diviſ.) Divid. (Quot
Z. Summ
X. difference.

1. Numeration gives the value we place upon the 9 Digits; the firſt place is of ſimple Unity towards the right hand, next Tens, next Hundreds, next Thouſands, *&c.* And ſo each place ten times more to the left hand; as you may ſee by the value of this number, 75,832 which is 75 thouſand 832.

And as this increaſeth towards the left hand, in a Decuple proportion, ſo may all parts or fractions of any whole thing decreaſe from Unity in the ſame proportion towards the left; as that after Unity to be Unity into 10 parts, the next into 100 parts, *&c.* and though we in *England* do do not divide our money, or meaſures into th parts, yet to make Arithmetick eaſie, we t our accounts into it; and for the better unde ſtanding hereof, take notice that at *Rome* th money conſiſts in Ducats, Julios, Baioccas: D cats is their Integer or whole Unite; ten Juli make a Ducat, and ten Baioccas a Julio: So th to expreſs 35 Ducats, 8 Julios, and 7 Baiocc they ſet them thus; 35,87, that in reſpect of J lios it is $\frac{8}{10}$ of Baioccas $\frac{7}{100}$ parts of a Duca This is the true Decimal Arithmetick or Na ral: But to break into other parts is inartifici $28\frac{2}{3}$ imagines the whole divided into 3 parts.

2. Addition, whether whole or parts, tak the general Summ, and Subſtraction the diff rence, keeping certain, th Unite be kept under Unite Suppoſe the *Ex.* here Duca Ju. and Ba. the Summ wou be 3547 Ducats, 3 Julios, an 8 Baioccas.

357,28
Ex. 92.7
315, 89
2781,51
(2) 3547,18

Ex. From 562 Ducats, 8 Jul. and 4 Ba. tak 381 Duc. 2 Jul. and 7 Baioc.

After Subſtraction there re mains 181 Duc. 5 Jul. and Baioc.

Ex. 562,85
381,27
181,57

Of theſe parts no more; i any Gentlemen or other, eſpe cially Ladies, deſire to look into their Disburſe ments, or layings out, and yet have not time t practiſe in numbers, they may, from Mr. *Hum phrey Adamſon*, dwelling near *Turn-ſtile* in *Hol born*, have thoſe incomparable Inſtruments, tha will ſhew them to play Addition and Subſtra ction in l. s d, any whole Numbers, withou Pen, Ink, or help of Memory; which were the Invention of that worthy Perſon, and Ornament of his Country, Sir *Samuel Moreland* Baronet

3. Mul

3. Multiplication by memory is fit for thoſe that have conſtant practice, but for certainty and eaſe no Invention ever came near that of the Lord *Nepair* by Rods, made either of Wood or Ivory. Sir *Samuel Moreland* has deviſed a neat way upon Circles, but Vaſtly chargeable, and that has been the reaſon why they have not been ſo well known. I have at laſt cloathed ſticks with Papers printed, and at very eaſie charge they are to be had ready varniſhed, better for uſe than made of ſilver, and ſold with this Book as one, with one or more papers ready to be paſted upon ſticks, if the Box ſhould be loſt, and cannot be falſe.

To double or treble a number will be found ready by any one, as to double 7584, ſay, twice 4 is 8, twice 8 is 16, ſetting down 6, and bearing one in mind; twice 5 is 10, and 1 I carried is 11, ſetting down 1 and carrying 1; twice 7 is 14, and 1 is 15; all which is 15168. The ſame for multiplying by 3.

Before I come to the uſe of the Rods, it will be very fit to ſhew how Multiplication may be wrought by making a Table of the Multiplicand to 9, as follows Suppoſe I would Multiply 6831, by 693, I take the Multiplicand 6831, and making a line before it, I ſet down the Digits to 9, I double it and ſet it againſt 2, I add the firſt and ſecond for 3, I double that againſt 2 for 4, add the ſecond and third for 5, double the third for 6, add the third and fourth for 7, double the fourth for 8, and add the fourth and fifth for 9. See the Table

Table X.

1	6831
2	13662
3	20493
4	27324
5	24155
6	40986
7	47917
8	54648
9	61479

6831 Mutiplic.
693 Multiplier.

20493
61479
40986

4733883 Product.

Now ſet d the Multiplic and Multiplier ſet in the Table number againſt and ſet it dow gainſt 9, and ſ one place to right hand, ag 6, and ſet ſtill place further, the *Ex.* whereby adding all the three Multip you have the general Product 4733883. may try with leſſer numbers, and perfect way in an hours time.

The Rods being ſet together, make this ble at one work for preſent view.

Firſt then, having the Box open, you ar the firſt ſight to know what figures ſtand each ſide of the Rod; that next to you is that under it, or the ſide the Rod lies on, is complement to 9, and the figures on both ſi of the Rod are ſeen at the bottom by two ſm figures under the black Line: Suppoſe you the Rod 6 upwards, you will know 3, the mains to 9, is under, and at the bottom you ſee 1 on one ſide and 8 on the other; ſo at glance you have four figures, know 6, 3, 8, and this is proper to each Rod, and muſt be fectly learnt. From hence you may find, 10 Rods have all the Digits four times over, is four 1, four 2, four 3, four 4. *&c.*

Having learnt quickly to find a Figure, next is to place the Multiplicand upon the Ro ſuppoſe in the *Ex.* 6831, I find theſe 4 figu as before, and placing 6 next the Index (fixt the Box) then 8, then 3 and 1; the Digits then Tabulated, and againſt every Digit in Index you have the very ſame figures as in

Ta

Table aforegoing, to be found with this Caution, c. 3. that you begin at the right hand, and taking out firſt the ſingle figure that ſtands in a triangle, after that you muſt take the two figures that ſtand in the Rombus, if there be two, and if both be under 10, write the Summ down as one figure; if above 10, write the ſurpluſage above 10 down, and carry one to the next cell; but all will be better ſeen from the Rods themſelves than 100 times from Words. See the (firſtFigure) in the laſt page, where you will find the former number 6831 on the top, and againſt 2 (which is two times the number) you have in the Triangle firſt 2, then in the next Rombus 6, next 2 and 1, which you ſet down as 3, laſt 1, which makes 13662, as in the former Table; next ſix times is firſt ſix, then 8, then (8 and 1) = 9, then (6 and 4) = 0, then (3 and 1) = 4; ſo the whole will be 40986, and nine times will be 9, 7, (2 and 2) 4, (4 and 7) 1, (5 and 1) 6, (61479) as in the Table before; a ſmall labour will make you read the Rods as quick as you may ſee them in the Table, either backward or forward.

If there be any decimal parts in the one or both Md or Mr, tell their number of places, for there muſt be as many places cut off by the diſtinction as were in both.

Multiply 37, 5, that is 37 Duc. and 5 Jul. by 15 91, that is 15 Duc. and 9 Jul. and 1 B. You ſhall have the Product 596, 625, that is 596 Duc. 6 Jul. 2 Baioccas and a half; there are 3 places cut off becauſe there was 1 in the Multiplicand, and 2 in the Multiplier.

4. Diviſion has no more difficulty than formerly; tabulate the Diviſor on the Rods, one Example will be ſufficient; let the Dividend be 4733883, the Product in the former Example, let 6831 be the Diviſor to be tabulated on the

Rods,

Rods, you have the multiplying of it to 9, fore which is here repeated.

```
1| 68311|  Divisor )   Dividend  ( Quoti
2|13662|    6831  )   4733883   (  69
3|20423|              40986··
 -------              -------
4|27324|              63528
5|34155|              61479
6|40986|              -------
 -------              20493
7|47817|              20493
8|54648|              -------
9|61479|                 0
 -------
```

The Table of the Diviſor ſtands for the Ro firſt, I ſee that 6831 will not be in 4733, the fore you muſt go 5 places ; then looking on t Rods, or in the Table, for a Number that is eq or next leſs to 47338, I find it to be 40916, t is 6 times the Diviſor ; I ſet 6 in the Quotie and ſubſtract 40986 from the figures above, re 6352, to which I add 8 the next figure of t Dividend, and ſeek again upon the Rods or T ble for it, or the next leſs, which I find to b times, I ſet 9 in the Quotient, and take 614 plac'd as in the Example, and ſubſtract it, r mains 2049, to which I add 3 the laſt figure a work as before ſaid, 3 times carries all away, a nothing remains, the Quotient being 693.

For Decimal parts there muſt be as many p ces in the Diviſor and Quotient as are in the D vidend, in this Example.

```
12,91 )  596,625   (37,5
         4773··
         -------
         11932
         11137
         -------
           7955
           7955
         -------
            0
```

In the Dividend the are 3 places, in the D viſor 2, therefore t Quot. muſt have 1 d cimal place, which 37 Ducats and 5 Juli and in caſe there i no Decimal or few in the Dividend than Diviſor, put as many Cyphers as you pleaſe after the Dividend, which are decimal places, and if you find that there be defect in the Quotient, put Cyphers before it to ſupply the places.

5 Extraction of the ſquare Root has ſome difference, but not much, from Diviſion. (1.) Point each other figure beginning with the laſt, as in the Example, 6, 5, and 7, which ſhews there will be 3 figures in the Root. (2.) Take the Rod called the ſquare Rod that has at the top a ſquare, and ſet it to the Index, and ſeek for the Figures; the firſt prick (57) you will find 49 neareſt; ſet 7 in the Quotient, and ſubſtract 49 from 57, reſts 8. (3.) To this Remainder (8) add the next two figures to the next prick (15) makes it 815, (4) Double the Quotient 7, *viz.* 14, and ſet it upon the Rods, and place thoſe Rods betwixt the Index and ſquare Rod, each time after the firſt work: Seek then upon the Rods for the next leſs or equal number to the figures 815, which I find to be 725, that is 5 times; ſetting 5 in the Quotient, ſubſtract, and to the Remainder add 2 places to the next point (36;) laſtly, double the Quotient 75, which is 150, ſet this betwixt the Index and ſquare Rod, and work as before, you will find the Root 756, which multiplied by it ſelf produceth the ſquare number 571536. If your Root be not perfect, but ſomething remains after the laſt Subſtraction, add Cyphers to the Square, and proceed.

```
      .  .  .
      571536 (756
      49
14)   815
      725
150)  9036
      9036
```

6. Extraction of the Cube Root; (1.) Point every third figure from the laſt, ſet the Cube Rod that hath Cu. on the head, to the Index in

the Box, ſeek the next leſs on the Rod, whi is in the Example 6 that is 4 times, ſet 4 the Quotient and ſu ſtract, reſts 27, which add 3 figures the next point, the f is 27733. (2.) Squ the figure found in Quotient, and triple (and this muſt be do each time) for a Di for, which ſet betw the Index and C Rod, in this Examp 4 being the Quoti multiply it by it ſelf, makes 16, and that mu plied by 3, makes = 48, which on 2 Rods I p in the box betwixt the Index and Cube Rod f Diviſor. (3.) Seek a Quotient, which will found 5, which ſet down, and the number ſwering 24125 place as in the Example, but fore you ſubſtract you muſt triple the Quoti which is 12, and multiply it by the ſquare of laſt figure 5, *viz.* 25, now 25 by 12 makes which place under 24125 one place forwa the left hand, as in the Example; then add t two numbers makes 27125, and ſubſtra reſts 608. This work muſt be repeated for e figure in the Quotient, *viz.* to 608 add 85 a Reſolvend, ſquare 45, and triple it makes for a new Diviſor, which being placed ne fore the Cube Rod, ſhews it will be but the Quotient, which anſwers to 607501, w is ſet down, and tripling 45, and multiply by 1, makes 135, which ſet one ſhort, mak the whole 608851, ſo that nothing remains ſomething remain add Cyphers, 3 for a f and it will give a Decimal fraction.

```
        91733851  (451.
        64
  48)   27733
        -----
         24125
          300
        -----
         27125
6075 )  608851
        ------
        607501
           135
        ------
        608851
```

C. 3.

Thus much with a little practiſe, and that the Boxes are to be had with the Book, will render all General, and it would too much augment this ſmall Volumn, to teach the uſe and making of Duodecimal Rods, Sexagenary for the old Aſtronomy, and Centeſſimal, all which works two figures at once.

7. *Nepaire*'s Rods will reach to great Numbers; but for Numbers under 100000, the ſaid worthy Lord invented a far eaſier way to perform Multiplication by Addition, Diviſion by Subſtraction, Extraction of the ſquare and Cube Roots by halving or triſecting, and all this by certain Numbers in a Table called *Logarithms*, Printed at the end of the Book, where in the firſt page all Log. anſwering to all numbers under 100 are eaſily found, *viz.* the Log. of 38 is 1.579783, of 72 is 1.857332, *&c.* If the number conſiſts of 3 places, that is a number under 1000, look for the number in the Table under N, and the Log. is found in the Column under O; ſo the Log. of 349 is 542815, of 893, is .950851. If the number be of 4 places, and under 10000, ſeek the 3 firſt figures under N, as before, and the laſt figure on the top, under which in that Column lineally againſt the firſt 3 figures you have the Log. As for Example: The Log. of 3583 is :554247, finding 358 under N, againſt which in the Column under 3, is that Log ſo the Log of 4268 is 630224, of 9546, :979821: But if the number be above 10000, and under 100000, you muſt find it by the difference and Table of Parts Proportionals Printed the end of the Table of Log. thus; if the Log. of 35786 be ſought, firſt ſeek the Log. 3578, which will be 553649, and the common difference under D, 121; with this difference enter the Table of Parts proportional, and find 121 in the firſt Column under D, and

then

then lineally againſt that number, and unde
the laſt figure of the laſt place of the numb
75786, found at the head in the 7th Column y
will find 72, which added to the Log. of 757
viz. 553649, makes 553721 the Log. of 75786.

, Now before we proceed to find numbers a
ſwering to Log: it will be fit to ſhew you, w
is meant by the firſt figure placed to the firſt
Log. which Mr. *Briggs* called a Characteriſti
or Index, which repreſent the diſtance of t
firſt figure of any whole number from Uni
whoſe Index is a Cypher or 0; and ſo the I
dex of Tens is 1, of 100 is 2, of 1000 is 3,
CM.XM.M.C.X.V.
as in this Line ſo th
5 4 3 2 1 0
in this Number 687325 the Index of 5 is 0,
7 is 3, of 6 is 5: But of Decimal parts
proceeds the other way; as that of ten pa
is $\bar{1}$, of 100 parts is $\bar{2}$, as in this Line 3,57
the Index of 3 is $\bar{0}$, of 5 is $\bar{1}$, of 8 is $\bar{3}$,
is $\bar{4}$; or after the propoſal of Mr. *Chriſtop*
Townley, take their Complements to 10;
inſtead of $\bar{1}$ take $\bar{9}$, of $\bar{2}$ take $\bar{8}$, of $\bar{3}$ ta
$\bar{7}$, which will make the Addition and Subſt
ction more eaſie and plain; if the former
uſed let it be called the firſt, if the later,
ſecond manner.

210, $\bar{1}\bar{2}\bar{3}\bar{4}\bar{5}\bar{6}$ Index the firſt wa
Of Indices 378, 234189 Number.
210, $\bar{9}\bar{8}\bar{7}\bar{6}\bar{5}\bar{4}$ Index the ſecond w

Having laid down the grounds for the
dices, or the firſt figure in each Log. the ab
lute Log. will readily be ſet down, making
firſt figure the Index of the firſt figure of
number; as the Log. of 5784, the firſt Lo
the Table, is 762228. The Index of the fir
gure of the number 5 is 3, ſo the abſolute L
is 3. 762228.

c. 3.

N. Log.

578,4 — 2.762228
57,84 — 1.762228
5,784 — 0.762228

So that the Log. is the ſame, but the Index of the firſt figure altereth.

,5784 — $\bar{9}$.762228
,05785 — $\bar{8}$.762228
,005784 — $\bar{7}$.762228

In pure parts the Log. is the ſame, but the Ind. altereth after the 2 way.

Now to find the number anſwering to a Log. given omitting the Index; ſeek the reſt ſix places in the Table of Log. and where you find the Sum, or neareſt, the numbers in the Margent N, and over that Column will make out 4 places; The Log. 3.544821, omitting the Index 3, I find 544821 to anſwer 3506, and the Index ſhews they are all Integers, the Index ſhewing the firſt figure to be the third from Unity 6; ſo the Log. 1.544821, would ſhew 35,06, that is 35 Integers, and $\frac{06}{100}$ parts, and $\bar{9}$.544821. ,3506 all Decimal parts, and $\bar{8}$.544821. 03506 parts. But if the Log. be not exactly to be found, and that you deſire to have places to five figures, firſt, find the number to 4 places as before, with noting the common difference under D on the ſide, and taking the difference betwixt the Log. given and the Log. found in the Table, then ſeeking the common Difference in the Table of Prop. parts, in that Line find out the difference of the Log and over the head you have the fifth figure. Example of this Log. 2.543612, the Log. next leſs is 543571 anſwering to 3496, the common difference is 124, the diff. of the Log. is 41, which in the Table of Prop. parts againſt 124 gives 3, ſo that the abſolute number is 34963, and becauſe the Index is 2, 34963. 124

Addition of two or more Log.

If the Indices be both (or all) Integer whole, add them without any more.

If the Indices be ſome Integers, ſome parts, is, be unlike, if the Index upon adding be 1 above, caſt away 10, the Remainder is the dex of Integers, if under 10 Decimal parts

If the Indices be both Decimal parts, a added be under 10, add 10 to the ſame, if 10 then 0, if above 10 caſt 10 away; the dex thus gotten is always of Decimal parts

$$\begin{array}{llll}
2.057821 & 2.237242 & \bar{9}.397941 & \bar{9}.875 \\
\underline{\bar{7}.583210} & \bar{9}.875062 & \underline{\bar{9}.875062} & \underline{\bar{8}.698} \\
.641031 & \underline{8.698971} & \bar{9}.273003 & \bar{8}.574 \\
 & 0.811275 & &
\end{array}$$

Subſtraction of Log.

If the Indices be whole, then as before.

If the Indices be either of them, or both cimal parts, ſet them one over another, the the higher be a ſmaller figure than the low add 10 to it, and obſerve whether the high of greater value than the lower; if ſo, the mainder will be Integers, if not, decimal p

$$\begin{array}{llll}
2.033421 & \bar{9}.875062 & \bar{9}.875062 & 1.235 \\
\underline{\bar{9}.875062} & \underline{2.033421} & \underline{\bar{8}.574031} & \underline{3.572} \\
2.158359 & \bar{7}.841641 & 1.301031 & \bar{7}.665
\end{array}$$

The Log. of a Fraction is found by ſubſt ing the Log. of the Denominator from the L of the Numerator: Sometimes it is found ceſſary to multiply a Log. by 2, 3, 4. *&c.* w If it be an Index of parts, obſerve that you the former Indices, *viz.* For the firſt

$\overline{123}$, &c. and that in multiplying the figure next the Ind. the Tens are affirmative, and are to be deducted out of the Product of the Indices of parts.

To divide a Log. of parts, if the Index be even it is ordinary, but if uneven, then add to the Ind. ſo many Units 'till it may be divided, ſetting the Quot. down for a new Index, augumenting the next figure by ſo many times 10 as you added to the firſt.

$\bar{2}$543211	$\bar{1}$.987214
3	5
$\bar{5}$.629633	$\bar{1}$.936070

3) $\bar{5}$.321412 3) $\bar{7}$.232151
$\bar{2}$.440470 $\bar{5}$.744050

The Admirable Uſes of the Log. Table

To multiply one Number by any other.

Add the Logarithms of the Numbers, the Sum is the Log, of the Product.

N.	Log.			
32 —	1.505150	5,12	0.709265	52X32 = 1664
[illegible] —	1.716003	1,55	0.190332	x 5,12 X 1,55
1664	3.221153	7.9360	0.899597	= 7,9360

To divide one Number by another is to ſubſtract the Log. of the Diviſor from the Log. of the Dividend.

	N.	L.	N.	L.
Dividend	7289 —	3.862489	,4512 —	^{3}.654369
Diviſor	32 —	1.505150	,0315 —	^{8}.498311
Quotient	227,8 —	2.35733[illegible]	14,32 —	1.156058

To extract the ſquare Root of any Number is to half the Log. of that N. or divide it by 2, the Quotient Log is the L. of the Root; and to extract the Cube Root, to divide it by 3.

Number 75832 — 4.879852 4 8798
Divided by 2) 2.439925 3) 1.6266
Square Root 275,37 Cube Root is 42,3

To find a mean proportional betwixt 2 nu
bers, is to add the Log. of them together, a
take half;

L.

The numbers are { 9 — 0.954242
16 — 1.204120

The middle Proportional 12 || Z 2.158362
|| ½ 1.079181

To find 2, 3, 4, 5, *&c.* mean Proportion
betwixt any two numbers, take their differen
and divide it by a number more by one th
the number of means deſired, as if 3 means d
vide it by 4, *&c.* this Log. Quotient added
the leaſt, finds the firſt mean next it, and ſo a
ded to the laſt finds the next, *&c.* It is deſir
to have 3 mean Proportionals betwixt 4 and 6
the Log of 4 is 0.602060, of 64 1,80618
theſe two added makes 1.204120, the ¼
0.301030, which added to the Log of 4, ma
0.903090, the Log: of 8 the firſt mean, a
again added gives 1 204120 the Log. of 16,a
again the Log. of 32, which 8, 16, 32, are t
three means betwixt 4 and 64.

8. Of Reduction, Greater names are broug
lower by Multiplication; as Pounds are broug
to Farthings by multiplying a Pound by 20, 1
and 4, and back again by dividing by 4, 12, a
20. Ordinary Fractions are reduced into D
cimals by multiplying the Numerator by 100
a thouſand, and dividing the Product by t
Denominator.

Hence are all the Fractions of money, weig

tim

ime, *&c.* turned into Decimals, as follows; c. 3.
Table I. of 1 l. Integer. The half of ſhillings is he decimal, as of 16 s. is 8, of 6 s. is |3, of 11 is |55 of 1 s. |05; and note in general once for all, that $\frac{1}{4}$ of any thing is |25 $\frac{1}{2}$ |5 and $\frac{3}{4}$ |75

DECIMAL TABLES.

Table I.
Eng. Coyn 1 *l. Int.*

Pence	
11	.045833
10	.041666
9	.0375
8	.033333
7	.029166
6	.025
5	.020833
4	.016666
3	.0125
2	.008333
1	.004 66
f. 3	.00313
2	.002083
1	.001041

Table II.
Troy wt. Int. 1. oz.

Peny wt, the ſame with ſhil.

gr.	
23	.047916
22	.045833
21	.04375
20	.041666
19	.039583
18	.0375
17	.035416
16	.033333
15	.03125
14	029166
13	.027083
12	.025
11	.022926
10	.020833
9	.01875
8	.016666
7	.014583
6	.0125
5	.010416
4	.008333
3	.00625
2	.004166
1	.002083

Table III. *Averd. great wt.* 112 C. l

lib.	
27	.241071
26	.232142
25	.223214
24	.214287
23	.205357
22	.196428

21	.1875
20	.178571
19	.169942
18	.160714
17	.151785
16	.142857
15	.133928
14	.125
13	.116071
12	.107142
11	.098214
10	.089285
9	.080357
8	.071428
7	.0625
6	.053571
5	.044642
4	.035714
3	.026785
2	.017857
1	.008928
oun.	
15	.008370
14	.007812
13	.007254
12	.006696
11	.006138
10	.005580
9	.005022
8	.004464
7	.003906
6	.003348
5	.002790
4	.002232
3	.001674
2	.001116
1	.000558

quart.	
3	.00041
2	.00027
1	.00013

Tab.IV. *Averd.li* *weight Int.* 1

oun.	
15	.9375
14	.875
13	.8125
12	.75
11	.6875
10	.625
9	.5625
8	.5
7	.4375
6	.375
5	.3125
4	.25
3	.18875
2	.1225
1	.06625
dr.	
15	.05859
14	.05408
13	.05078
12	.04687
11	.04296
10	.03992
9	.03515
8	.03125
7	.02734
6	.02343
5	.01953
4	.015625
3	.01171
2	.00781
1	.00390

quart	
3	.002929
2	.001953
1	.000976

Tab. V. *Liq. Meaſure Gal. or Quar. the Int.*

7	.875
6	.75
5	.625
4	.5
3	.375
2	.27
1	.125
quart.	
3	.09375
2	.0625
1	.03125

Tab. VI. *Inches in Dec. Int.* 1 *Foot*

inches	
11	.916666
10	.833333
9	.75
8	.666666
7	.583333
6	.5
5	.436666

4	.333333
3	.25
2	.166666
1	.083333
quart	
3	.0625
2	.041666
1	.020833
½ quar.	.010416

Tab. VII. *Decimals of a Year.*

Month	
1	.083334
2	.166667
3	.25
6	.59
9	.75
Days.	
1	.0027397
2	.0054795
3	.0002193
4	.0109591
5	.0136988
6	.0164380
7	.0191784
8	.0219132
9	.0246579

The uſes of the Decimal Tables.

Any parts of money, weight or meaſure given, you may turn into Decimals or *contra*. 3 l. 15 s. 7 d. ½ = 3,78124, for 15 s. = 75. 7d. = 029166, and ½ 00208, in all 3 l. ,78124. Again,

gain, 16 C. ¼ 17 l. Averd. weight $=$ 16, If Decimals be to be turned into their again, as 37 l. ,5692, first 37 l. is the then 55 of the first 2 figures will be 11 the remainder ,0192 will be 5d. ½.

9 A ſhort Specimen of Fractions for the ter remembring the Rules of

(1.) of the great‖ Common meaſure‖ Ex. of $\frac{36}{54}$ $\begin{array}{l}36)\;54\;(1\\36\quad 36\\54\quad 18)\;36\;(2\end{array}$ C. M. 18)

(2.) Reduction 16) $\overset{15.}{\underset{3.}{\frac{5}{12}}}$ $\overset{14}{\underset{2}{\frac{7}{18}}}$ are $\frac{15}{36}$ and

3. Fractions of Fractions $\overset{12}{\underset{84}{\frac{1}{4} \text{ of } \frac{2}{4} \text{ of } \frac{6}{7} =}}$

4. Addition and ſubſtract.‖ of fractions reduced ‖ $\frac{15}{36} + \frac{14}{36} =$

5. Multiplicat. $\frac{2}{3} \times \frac{4}{5} = \frac{8}{15}$ (6) Diviſ. $\frac{4}{5}$)

10. Of Progreſſions and Combinations

1. Geometrical progreſſion that begins Unity, you may come at any term of it by tiplying the Log of the ſecond term by number of ſo many places, as the diſtance quires leſs, 1. Ex. in a progreſſion that is ble, have 1, and the ſecond term 2, and deſire the 8 term, multiply the Log. of 2 it gives you 2. 10721 ; the Log. of 128, the

term, and this holds if the firſt term be not Unity, if you take the Log. of the Ratio.

2. Combination of things may differ many ways; Two only are here conſidered: (1.) In the changing their poſition, as in ringing of bells, the other in the matter or ſubſtance; for the firſt, ſet down a Series of numbers from Unity, multiply 1 by 2 ſhews 2 things can be changed twice: Again 2 x 3 = 6 ſhews three things may change 6 times, 4 may change 24, and 5 120.

As
1, 2, 3, 4, 5, 6,
2.6.24.120.720.

For the ſecond, ſuppoſe *a b c* be eſſentially different a Ternary; There are three Unites, *a*, *b*, *c*. three Binaries, *ab*, *bc*, *ac*, and one ternary *abc*. and ſo many Combinations there may be and no more.

Now to find out the Combinations it is eaſily done by the poſterior Table in Mr. *Oughtred's Clavis Matth.* p. (37) he calls it (*plena hæc myſteriis pulcherimis Tabula*) I ſay the numbers ſet by the Species ſhew the Combinations deſired, only one of the extream Unites muſt be left out, and the obtaining thoſe numbers is thus; ſet down Unity, then repeat two Unites and leave one ſpace, and then 2 ſpaces,3,4,&c. the Intermediate are filled by adding the numbers on either ſide ſtanding above, as to make up the loweſt row 1+4 = 5 ſtanding next above on either ſide, 4 + 6 = 10, &c. then leaving out the Unites, on the right hand: ſo that if the matter be 3, there may be 3 Unites, 3

1
1.2.1.
1.3.3.1.
1.4.6.4.1.
1.5.10.10.5.1.
&c.

1	1 ————	= 1
2	2 + 1 ————	= 3
3	3 + 3 ————	= 7
4	4 + 6 + 4 + 1 ————	= 15
5	5 + 10 + 10 + 5 + 1 --	= 31
&c.		

Binaries and 1 Ternary in all 7 Combinations.

If the matter be 4, there may be 4 Unites, 6 Binaries,4 Ternary,and 1 Quaternary, 15 = &c.

11. *Of Proportion.* Direct is, when more requires more; and leſs leſs: This is called the *Golden Rule*, when 3 numbers are given to find a fourth, and requires that the ſecond and third terms be multiplied together, and the firſt divide that Product, the Quotient ſhews the anſwer: Ex. If 5 yards of any thing coſt 15 s. what ſhall 45 yards coſt? An. 6 l. 15 s. for ſetting them down thus; 5. 15 :: 45. 45 X 15 = 675 and 5) 675 (135 = 6l. 15 s.

The Back Rule requires the firſt and ſecond to be multiplied, and that the third divide that Product. And this Rule is known, becauſe the more will require leſs, or leſs more. Ex. if 4 horſes eat 5 pecks of oats in 3 days, 8 horſes will eat 5 pecks in a leſſer time.

The Double Golden Rule, or Rule of 5 Numbers is of great uſe in many reſpects, and therefore as it is eaſily explained in *Moore's Arith.* take it from thence: Let that which is the principal cauſe of loſs or gain, intereſt, action, &c. be put in the firſt place; that which betokneth Time, diſtance of Place, &c. be in the ſecond place, and the remaining in the third; under this Conditional part place the two other terms each under his like; and there will be a blank to ſupply under one of thoſe above, either under the firſt, ſecond, or third. Ex. If one hundred pound in 12 months gain 6 l. (this is the Conditional part) what ſhall 50 l. get in 3 months, place them down as in the Rule; and here the blank is under the third term, but if the demand had been, in how many Months would 50 l. have gained 15 s. or if 100, in 12 month

lib.	m.	
100.	12.	6 l.
50.	3.	

12 months gain 6 l. what ſhall the principal be, that in 3 months would gain 15s.; in theſe two laſt caſes the blank would have been under the firſt or ſecond terms, there are but theſe Caſes; Rule 1. If the blank be under the third term, multiply the three laſt for a Dividend, and the two firſt for a Diviſor, the Quotient of theſe gives the ſixth; $6 \times 50 \times 3 = 900$ and $100 \times 12 = 1200$ now 1200) 900, 0 (,75 = 15s. But if the blank fall under the firſt or ſecond term, then the rule will be; Multiply the firſt, ſecond and laſt for a Dividend, and the third and fourth for a Diviſor, the Quotient is an Anſwer: This Rule ſhews ſimple Intereſt, and all belongs to it with eaſe, and was thus found. Set with Mr. *Mern*, P. T. G. for the principal Time, and Gain in the Conditions, and p. t. g. anſwering, it will be $P.\ G. :: p.\ \frac{Gp}{P}$ and $T.\ \frac{Gp}{P} :: t.$ $\frac{Gpt}{Tp} = g.$ So that multiplying the 3 laſt for Dividend, and 2 firſt for Diviſor is the firſt Rule, and becauſe $\frac{Gpt}{Tp} = g.$ it will be $Gpt = TPg$ therefore $t = \frac{Tpg}{pG}$ and $p = \frac{Tpg}{Gt.}$ which is the ſecond Rule.

12. To any two Tumbers, to find a third in continual proportion, Rule. Square the ſecond, and divide it by the firſt.

CHAP.

CHAP. IV.

Rules of Practice, IN ARITHMETICK

For Intereſt, plain and ſpherical Triangles, Meaſuring of Plains, Solids, Circles and Spheres, Gaging, Fortification, Gunnery, Aſtronomy, Dialling, making of Watches and Movements, Geography, Navigation.

§1. RUles of Practice in Arithmetick; First learn to half a number from the left to the right ſpeedily; As for *Ex.* 8431076, the half is 4215538, beginning with 8 take 4, of 4 take 2, theſe are even and eaſie; but for 3, I take 1, and carry 10 to the next, which is 11, I take 5 remains 10, then for the 0, I take 10 and ſet down 5, for 7, 3, and for 16, 8. This brings ſhillings into pounds by cutting off the laſt figure, and taking the half of the reſt; thus 7946 s. make 3,92 l. 6 s. *&c.*

2. Becauſe that 12 pence make a ſhilling, it will be well to be expert in Multiplying or Dividing by 12: A ſmall Paper of Duodecimal Arith. was 11 years ſince drawn up at the deſire of Sir *Rob. Long*, and it ſeems admirable with what eaſe and fewneſs of figures, that Arithmetick will work all meaſures by foot and inches, and 12 parts for the inch, and for ſhillings and pence, and 12 parts of a penny: Here muſt two figures or digits be added, *viz.* x for 10, and n for eleven, the Account will be Unites, Dozens, Groſſes, *&c.* and the parts will diminiſh

diminiſh accordingly : But here is not room to explain it, take an Example : A piece of black Marble 2 feet 9 inches and half broad ; 3 f. 2 inch. and a quarter deep, and 8 foot 3 inches long, how many feet ? And what rate at 1 *s.* 3 *d.* 2 *q. per* foot .

In the firſt operation, †6 = 18, for which ſet down 6 (the overplus above 12) and carry one; then 3 † 9 = 27, and 1 I carried makes 28, for which I ſet down 4 the overplus above 12 *s* and carry 2, the 12 *s.* in 28 ; then 3 †2 = 6, and 6 † 2 = 8, the which I ſet down. Then I come to the Multiplier 2, and ſay 2† 6 = 12, I ſet down 0 and carry 1; then 2 †9 = 18, and 18†1 = 19, for which I ſet down 7, and carry 1, and ſay 2 † 2 = 4, and 4 † 1 = 5, which I ſet down. Thirdly, I take the multiplier 3, and ſay 3 † 6 = 18, and ſetting down 6 carry 1, then 3 †9 = 27, and 27 † 1 = 28, for which I ſet down 4 and carry 2, then 3 †2 = 6, and 6 †2 = 8, *&c.* which three Products I add, carrying 1 for every 12, and ſetting down the overplus, ſo is the ſolidity of the whole Marble 6 dozen and 1 foot, or 73 ſolid feet and 1 third, and by the ſecond operation, the price will be 7 dozen 10 *s.* that is 94 *s.* 8 *d.* 3 *q.*

```
     (Op.1.)  (Op.2.)
       2.96     61.4
       3.23     13.6
       ----     ----
       846      3080
      570      1640
     846       614
     ----      -
     8.x.946  7x.880
     8.3      ------
    ----
   2284
  51122
 61.4x4=94s.8d3q.
```

This Table of twelves, or Shillings and Pence is to be got without Book.

d.	s.
12	1
24	2
36	3
48	4
60	5
72	6
84	7
96	8
108	9
120	10
132	11
144	12

3. The Aliquot or even parts of Shilling Pounds are to be lèarnt, as 1 *d.* 2 *q.* is the eighth part, 1 *d.* the twelfth part, 2 *d.* the part, 3 *d.* the fourth part, 4 *d.* the third 6 *d.* the half of a Shilling ; 1 *s.* the twen part, 2 *s.* the tenth, 4 *s.* the fifth part, 5 *s.* fourth part, 3 *s* 4 *d* the ſixth part, 6 *s* the third part, and 10 *s.* the half of a po knowing theſe, the price of any one thing be known, if 1 *l.* or 1 Integer of that thin known. At 6 *d.* the ounce, what comes ounces, becauſe 6 *d.* is the half of a Shilli take half of 372 = 186 Shillings : The pra you have in every Book of Arith. Like you may obſerve the even parts of other thi ſuppoſe the great hundred 112 *l.* the half is the quarter 28, the eighth part is 14, the teenth part 7 ; ſo that at 54 *s.* the C. w come 15 C. 3 quarters and 18 pounds, the w hundreds come to 40 *l* 10 *s.* the 3 quarte three fourths of 54 *s.* which is 40 *s*, and 6 Laſtly, for the 18 *l.* find what 14 *l.* comes *viz.* 6 *s.* 9 *d.* and 4 *l.* to 1 *s.* 11 *d.* in all 4 19 *s.* 2 *d.*

4. The hundred weight whether neat, or great C. which is 112 *l.* it will be worth w to give you the price of either at any ſmall r the pound weight ; Ex. at 3 *d.* 2 *q.* the po what comes either C. to: Put the price of pound into farthings, *viz.* 14 ; for the Neat account twice ſo many Shillings, and as ma pence as farthings ; and for the great C. tw ſo many Shillings, and as many Groats as the be Farthings in the pound weight. Ex. 14 and 14 *s.* make 28 *s.* and 14 *d.* makes 29 *s.* 2 the Neat C. and 14 *s.* twice, and 14 Gro make 32 *s.* and 8 *d.* for the great C. So da expences are for every penny ſpent a day, o pound: one half pound, one groat, and o

pen

penny: 5 *d.* a day is after that rate 7 *l.* 12 *s.* c. 4 1 *d.* There is conſtant uſe made of the great hundred, therefore I have annexed a Table, which in the firſt Column contains the price of one pound from 1 farthing to 2 *s.* and in the ſecond you have the price of the *C.* weight; the greater Figures are pence, the leſſer farthings. If the price exceed the Table, take half, or a quarter of it, and double or redouble the price; and ſo ſeeking in the Table for the price of a C. weight, you have the price of a pound or unite anſwering.

A Table

A Table for buying and ſelling by the C. w

l. p.	C. pr.	l. p.	C pr.	l. p.	C. pr.	l. p	C p
	l. s. d.		l. s. d.		l. s. d		l. s
1	0. 2. 4	6. 1	2.18.4	1	5.14.4	1	8. 10
2	0. 4. 8	2	3. 0. 8	2	5.16.8	2	8. 12
3	0. 7. 0	3	3. 3. 0	3	5.15.0	3	8. 15
1	0 9. 4	7	3. 5. 4	13	6. 1. 4	19	8. 17
1	0.11.8	1	3. 7. 8	1	6. 3. 8	1	8. 19
2	0.14.0	2	3.10.0	2	6. 6. 0	2	9. 2
3	0.16.4	3	3.12.4	3	6. 8. 4	3	9. 4
2	0.18.8	8	3.14.8	14	6.10.8	20	9. 6
1	1. 1. 0	1	3.17.0	1	6.13.0	1	9. 9
2	1. 3. 4	2	3.19.4	2	6.15.4	2	9. 11
3	1. 5. 8	3	4. 1. 8	3	6.17.8	3	9.13
3	1. 8. 0	9	4. 4. 0	15	7. 0. 0	21	9.16
1	1.10.4	1	4. 6. 4	1	7. 2. 4	1	9. 18
2	1.12.8	2	4. 8. 8	2	7. 4. 8	2	10. 0
3	1.15.0	3	4.11.0	3	7. 7. 0	3	10. 3
4	1.17.4	10	4.13.4	16	7. 9. 4	22	10. 5
1	1.19.8	1	4.15.8	1	7.11.8	1	10. 7
2	2. 2. 0	2	4.18.0	2	7.14.0	2	10.10
3	2. 4. 4	3	5.0. 4	3	7.16.4	3	10.12
5	2. 6. 8	11	5. 2. 8	17	7.18.8	23	10.14
1	2. 9. 0	1	5. 5. 0	1	3. 1. 0	1	10.17
2	2.11.4	2	5. 7. 4	2	3. 3. 4	2	10 19
3	2.13.8	3	5. 9. 8	3	3. 5. 8	3	10. 1
6	2.16.0	12	5 12.0	18	3. 8. 0	24	10 4

Tuns are brought into hundreds by Multip. by

4. The laſt Note ſhall be, that in weighing Goods, the weights 1 *l.* 3 *l.* and 9 *l.* w weigh all from 1 *l.* to 13. 1 *l.* 3 *l.* 9 *l.* 27

ll from I to 40. I l. 3 l. 9. 27 l. 81 l. all C.4.
rom 1 to 120, &c.

At the later end of the Book you have a able for the ſumming up of Commodities, the ſe is plain by Inſpection only.

§ 2. Rules of Practice for caſting up of Inte- ſt Money, whether Simple or Compound, re- ates and values of Leaſes.

1. Note is of ſimple Intereſt, of uſe amongſt erchants, you muſt know readily to caſt up he days betwixt any two named times: In one ear $365\frac{1}{4}$ in two years $730\frac{1}{2}$, in three years. $1095\frac{3}{4}$, and likewiſe by this Table to find the days; Ex. 1. From the beginning of the year to the 11th. of Oct. October has 273 days, and 11 makes 284. Ex. 2. from the 12th of March to the 16th of December, ſubſtract Mar. 59 + 12 = 71 from Dec. 3, 4 + 16 350 reſts 279 days. Ex. 3. From 10th of June 1673 to the 5th of Febr. 1674. Say 0 + 184 + 31 + 5 = 240 days. The Intereſt or one day of one Pound at 5 l. *per Centum* is this ecimal, ,0001369836, at 6 *l* *per Centum* 00164384, which are gotten by dividing 5 nd 6 by 36500; and ſo of any other: Now o find the Intereſt of any ſum of Money for ertain days, firſt find the Intereſt of one pound or that time, by multiplying ,000164384 for *per Cent.* by the days; and then that product

334	*Jan.*	00
306	*Feb.*	31
275	*March*	59
245	*Apr.*	90
214	*May*	120
184	*June*	151
153	*July*	181
122	*Aug.*	212
92	*Sept.*	243
61	*Octob.*	273
31	*Nov.*	304
00	*Dec.*	334

by

by the Sum of Money gives your deſire ; o
ſily if you add the Logarithm of $\bar{6}.2158621$
6 *per Cent.* or $\bar{6}.13666528$ for 5 *per Cen*
the Log. of days, and the Log. of the Su
Money propoſed together, it gives you the L
of the Intereſt ; and to rebate or to know
preſent worth of any Sum due hereafter,
muſt find the Intereſt of 1 l. for that time,
ding 1 Integer to it, and divide the Sum
pounded by it, the Quot. is the preſent w
Here follows a Table of ſimple Intereſt of
for any days under 10000 at 6 *per Cent.*

D	M			C		X
	lib.	s.	d.	s.	d.	d.
1		3:	3.452		3.941	.394
2		6:	6.904		7.890	.789
3		9:	10.356		11.835	1.183
4		13:	1.808	1:	3.780	1.578
5		16:	5.260	1:	7.726	1.972
6		19:	8.712	1:	11.671	2.367
7	1:	3:	0.164	2:	3.616	2.761
8	1:	6:	3.616	2:	7.561	3.156
9	1:	9:	7.068	2:	11.506	3.550

The uſe of this Table is eaſie ; the firſt C
lumn are days, and if uſed with the ſec
Column are thouſands ; if with the third
hundreds ; if the fourth are tens, and the
are ſingle Unites. Ex. What is the uſe of
for 1732 days. An. 5 s.
8 d $\frac{1}{4}$ f.r,25 = 1 f. 50 =
2 f. 75 = 3 f. and if you turn
the Intereſt of one pound
found as before into deci-
mals, and multiply it by the

	l.	s.	d
1000	0	3	
700		2	
30			
2			
	5	8	

Sum propounded in Decimals, It gives the
tereſt of that Sum. And for equation of
ments, or giving of time, as at 2 three Mon

C.4.

at 3 ſix Months, &c. or Weeks, Years, or ys, or the like; ſuppoſe three, 3 Months, ltiply the terms 3 and 3 makes 9, add the r 3 makes 12, the half whereof is the e- ted time, *viz.* 6 months. So the equation 4 ſix months, is 15, *viz.* 4x6 = 24 + 6 = —— ½ 30 is 15. To conclude this Note of ple Intereſt practiſe is the double Gol. Rule ght before, it anſwers all queſtions whether the principal, time, or gain.

2. Of Compound Intereſt, or Intereſt upon ereſt. The Logarithms anſwer queſtions of is nature with great eaſe; and firſt if the Intereſt be at 6 *per Cent.* find the Log. of 106, vide it by 2 for ½ Years, by 4 for Quarters, 12 for Months, and by 355 for Days, and ep theſe Log. for Uſe. You have ſix Queſtions in *Moore's Arith.* wrought at large, the following Examp. will make all plain for 1 l. *viz.* Mr. *Oughtred's* ſix *Theorems* after 6 *per Cent.* *viz.* A, B, C,D,E,F.

g.of 1,06	0.025306
½ Year	0.012653
¼ Year	0.006326
Month	0.002109
Week	0.000527
Day	0.000075

The. 1. *P.* lends to R. 1 l. for 3 years, what muſt *P.* receive at the nd of the term? A.

The. 2. *P.* hath owing from R. 1 l. at the nd of three years, and would know the worth n ready money? B.

Yearly,
1,06 — 0.025306
3
A 1,1910 0.075918
B ,83962 9,924081 Ar.Co.

So that A anſwers the firſt Queſtion; that is, *P.* muſt receive 1 l. and ,191 of 2 l. that is, 3 s. and 10 d. And B the

B the ſecond, that is, 16 *s.* 9 *d. ob.* *A* is g by multiplying the Log. of 1,06 by 3; and the Arithmetical Complement of *A*.

The. 3. *P* hath an Annuity of 1 *l. per,* and *R* forbears payment to the end of years, what will it amount to? *C.*

The. 4. *R* is to pay 1 l. at the end of years unto *P*, and would know what rent be paid yearly for that Debt? *D.*

First, *A.* 1 is 1,191 — 1 = ,191, and 1,06-1 = ,06 After Subſtraction it leaves the Log. 6 of *C* 3 l. 3 s. 8 d. and Arithm. Complement is *D.* 6 s. 3 d. ob.

1 *A* ——	= ,191	^{9}281033
1,06---1	= ,06	^{8}778151
C	3,1833	0.502882
D,	31413	^{9}.497117 Ar.C

The. 5. *P* has an Annuity of 1 *l. per an.* three years, and would know the preſent w in ready money.

The. 6 *P* hath 1 *l* to beſtow of an Ann for three years, and would know the ye Annuity.

The anſwer to the 5th *Theo.* is *E* 2 l. 13 s. 5 d. ob. and the 6th *F* 7 s. 6 d. Thus

C	3,1833	0.502882
A	1,191	0.075918
E	2,6728	0.426964
F	,37414	^{9}.573036

for 1 l. the Anſwers are fitted to all the 6 ſtions, and the ſame is to be perform'd a the like manner, if the payments were half ly, quarterly, *&c.* taking the Log. anſwering before. And after you have found your ſwer for 1 l. by adding its Log. to the Log any other Sum, it gives your deſire. E 352 l. 10 s. were due 3 years hence, and I ſire to know what it is worth to pay preſen I add the Log. of 352,5 — 2.547159 to the L

3̄ 924081 found as before makes 2. 471240, C · 4 ·
hich is the Log of 295 97, or 295 l. 19 s. 6 d.
he Anſwer.

Rules concerning Free-holds to be bought nd ſold.

The Annual Rent, divided by the bare Rate f Intereſt propoſed, produceth the Sum of eady Money that Free-hold Eſtate is worth. Example: 300 l. *per. an.* after the rate 6 *per. Cent.* is worth 5000 l. ,06) 300,00 (5000.

And if the Rent be ½ yearly or quarterly, ivide by ,0296 and ,014674.

Any ſum of Money (1000 l.) lying ready for Purchaſe being multiplied by the bare rate of ntereſt, (,06) produceth the yearly Rent. 1000 ,06 = 60,00 or 60 l. *per. annum.*

The Annual Rent (60 l.) being divided by a um propounded (1000 l.) quotes the bare Intereſt of 1 l. 1000) 60,00 (,06.

Divide Unity (1) by the bare rate (,06) of l. the Quotient gives the number of Years purchaſed. ,06)1,00(16,6 5)1,00(20 8)1,00(12.

If the Rents be ½ yearly or quarterly paid, ork as you were formerly directed.

Here follows a Table to Purchaſe by, at 5, 6, 8, and 10, *per. Cent.* Intereſt.

Y.	*5 per C.*		*6 per C.*		*8 per C.*		*10 per*
1	0	10	0	10	0	11	0
2	1	11	1	11	1	9	1
3	2	9	2	8	2	7	2
4	3	7	3	6	3	4	3
5	4	4	4	3	4	0	3
6	5	1	4	11	4	7	4
7	5	9	5	7	5	2	4
8	6	6	6	2	5	9	5
9	7	1	6	10	6	3	5
10	7	9	7	4	6	9	6
11	8	4	7	11	7	2	6
13	9	5	8	10	7	11	7
15	10	5	9	9	8	7	7
17	11	2	10	6	9	1	8
19	12	1	11	2	9	7	8
21	12	10	11	9	10	0	8
23	13	6	12	4	10	4	9
25	14	1	12	9	10	8	9
27	14	8	13	3	10	1	9
29	15	2	13	7	11	12	9
31	17	1	13	11	11	4	9
41	17	7	15	1	11	11	9
51	10	3	15	9	12	3	9
61	18	11	16	2	12	4	10
71	19	4	16	5	12	5	10
81	19	7	16	6	12	6	10
91	19	9	16	7	12	6	10

The firſt Column is of Years, the ſecond time to Purchaſe, the firſt Figure being the ſecond Months. A Rent to endure 7 is worth ready Money after 5 l. *per Cent.* and 9 months ; the third Column is at *Cent.* the fourth at 8, and the fifth a 5 l. *per Cent.* is at 20 years purchaſe, 6 l. years and 8 months, 8 l *per Cent.* at 12 y an half, 10 l. *per Cent.* at 10 years : So th and 6 l. *per Cent.* may be uſed for Fr Eſtates, and the 8 l. and 10 l. for Houſes

§ 3. Of Plain and Spherical Triangles. C·4·

Inſtead of Chords, the Sines and Tangents were invented, and brought to a Decimal Radius; and it might be wiſhed; that the Saxagenary Account be left off, and the Centeſimal taken.

After the Logarithms, you have a Table of Artificial Sines and Tangents to every degree and minute.

The Sine or Tangent of every degree and Minute, if they be under 45 Deg. are found by looking in the Column on the left ſide, the Degrees are in greater figures, and if above 45 deg. by looking in the Column on the right ſide, accounting from the bottom towards the top. *Example:* The Sine of 13° 30′ will be found 9.368185; the Tangent 9.380354; the Sine of 67° 20′ will be found 9.965090; the Tang. 10.379213: The Complement of any Degree and Minute being the Remainder of the ſame to 90°, anſwers in the ſame line in the two outmoſt Columns; as to 22° 10′ anſwers 67° 50′, and ſo doth the Sines and Tangents, for the Sine of 22° 10′ being 9.576689, the Sine 9.966653 being its Complement or Coſine of 67° 50′ ſtands next; and ſo of the Tangents.

Now to find the degree and minute anſwering to any Log given; ſuppoſe the Sine 9.457584; I ſeek this in the Table, and find it anſwers 6° 40′, and to this Tangent 10.475410, 71° 0′, and if you ſeek for every ſecond, you muſt take the difference of thoſe two Log. betwixt yours and the leſſer; then ſay, *As* the firſt Difference, *Is* to the other Difference : : *So* is 60. *To* the Seconds ſought. *Ex* The Sine 9.500163, being given, the next leſs in the Table 9.499963, the difference 200. The Tabular diff 379, then ſay, If 379 60, 200, it will give 32, ſo the correſpondenreſpondent Degree, Minute, and Second, will 18° 20′ 32″. This being learnt we come to t Doctrine of Plain Triangles, but firſt know th Characters; ∠ an Angle; rt ∠ a right Ang l. a Side; Hyp. he Hypothenuſe; Ba. Baſe, C Cathetus, Δ Triangle; Dat. given; S. Si T. Tangent; Cot Coune; Cot. Cotangs.

1. Of plain Δs, let every rt angled Δ be
ted with three Letters, A, B, C; le
(rt. ∠) be the rt ∠, BA the Baſe, CA the C
thetus or Perpen. and BC the Hy
(F. 1) thenuſe, and all oblique Δs with B
(F. 2) let BD be the Baſe; then obſerve th

Propoſitions.

Prop. I. The Sides and Sines of the oppo Angles are proportional, and in any Trian where two Sides, and one Angle oppoſite, given, and it be required to find the Angle poſite to the other ſide; As l.. S. ∠ opp. :: S. ∠ required: Or if two Angles, and the S oppoſite, the one be given, to find the l. op ſite to the other: Say, As S. ∠ l. opp. :: S. required: this reacheth generally to all Δs, N that in a rt ΔΔ if one accute Angle be kno the other is known, because it is the Com ment to 90°, and in an oblique Δ if two gles be known, the third is given, becauſe Complement to 180°

Prop. II. In rt ∠ Δs. As one Side to the
ther :: So is the Rad to the Tang
(F. 1.) an ∠ oppoſite to the other, B A . C
Rad. t. ∠ B.

Prop. III. In every plain Δ. As the ſum the two Sides, is to their Difference: : So is Tangent of half the ſum of the two opp Angles, to the Tangent of half their Differe therefore if two Sides and the Angle incl be given, the reſt will be known.

Prop. IV. As the greater Side, to the S

C. 4

the reſt :: So is the Diff. of thoſe two remaining Sides, to the Difference of the Segments of the Baſe; the Perpendicular will fall in the middle of the Remainder.

Theſe four *Prop.* will reſolve all plain △s.

Ex. In the △ ABC rt ∠ at A. Let the Hypothenuſe B C be given, and ∠ B to find the Side CA. By the *I. Prop.*

Rad. 90° — 10.000000
B C 1277 — 3.106191
t: ∠ B 28° 20′ — 9.676321
C A 606 — 2.782519

Having B A the diſtance from any place to the foot, 1124 feet or yards, and ∠ B 28° 20′, to find the height CA 606 feet or yards: By *Prop. II. Fig.* 3.

Rad. 90° — 10.000000
B A 1124 — 3.050766
t: ∠ B 28° 20′ — 9.731745
C A 606 ——— 2.782512

In the oblique ∠ △ DBC, *Fig.* 3. having the ∠ C D B 43° 20′, and the ∠ C B A 58°, the ∠ DBC will be 122, and the ∠ D C B 14° 40′, the firſt two ∠s are had by obſervation, the other Complements, by the *I. Prop.* you may have D C 335, and B C 271, which are the diſtances from D and B to C, though you came no nearer than D. Likewiſe in the rt ∠ △ BCA, ſuppoſing C A ſome height unaproachable, after the Angles at D and B be taken, and the diſtance B C 271, as before; you may find by the *I. Prop.* C A 230 feet, yards, *&c.* the height, and B A the diſtance 143,7; and by theſe two laſt Exam.

S. B. 14° 40′	9. 403455
D B — 110	2. 000000
S. C 43° 20′	9. 836477
l. B C — 271	2. 433022
S. DBC--580	9: 928420
t. D C---335	2. 524965

all heights and diſtances, whether acceſſible no, are taken.

2. Of Spherical Triangles, and firſt of rt ∠ In theſe there are five Parts, beſides the r (which is no part) to be conſidered ; in the ABC, (*Fig.* 4.) A is the rt ∠, the Sides B and C A are taken ſimply, which make t parts, the ∠ C and B, and the Side B C by the Complements, which make three parts, five all : Three of theſe always fall into the Q ſtion, whereof two are given and one dem ded ; and theſe three in the Queſtion either all together, as B, BA, AC, or BA, AC a C, or AC, C, BC or BC, B and BA, or C, B and B, (in all which five caſes BA, AC, C, B a BC, are the Means, and the other two the E treams,) or a ſunder or disjunct ; as BA, B and C ; BC, BA, CA ; C, B and BA, whe BA, BC and C, which are ſeparated from t other two, are called the Intermedials, the ot the Oppoſites,

A 1. As Tang. of one Extreme, to the Sine the Mean :: So is Rad. to Tang. of the other.

A. 2. As Si. co. of the one oppoſite, to S of the Intermedial :: So Rad. to the Co of the other.

By theſe two *Ax.* and the former obſervatio any part of rt ∠ may be gotten by know two parts : Ex the Δ BAC, wh let B repreſent Equinoctial Po and the Angle of greateſt Dec 30', and BC a p of the Ecliptick 34° 20, I demand CA t Dec. Here B and BC are given, CA dem ded, CA are disjoyned, and B, BC, are t oppoſites ; therefore by the ſecond *Ax.* As

As Rad———10.000000
Si. BC,34°20' — 9.751284
Si B,23°30' — 9.600700
Si CA,13° — 9.351984

Co

C· 4·

Coſy. BC :: Si. co. B. Sine of CA; but you re bid to take the Complements of B and BC, herefore as in the work, R. Si BC :: Si. B. ine CA; this is plain and ſufficient for rt ∠ △s.

Of oblique Spherical Triangles, the Parts are ix, three Sides and 3 Angles, whereof three are iven, and 1, 2, or 3, may be ſought; four of heſe ſix are called Ingredients, whereof 3 muſt e given and one ſought: And of theſe 4, there ay be three ſeveral Diviſions; Firſt, they may e oppoſed one to another, as l. to ∠, and l. to , or contrarily, and then S. ∠. S. l. :: S. ∠. S. or S. l. S. ∠ :: S. l. S. ∠. Secondly, they l follow together; or, Thirdly, three together, nd one removed. In the two latter, the part ught may be found at two Operations and no ore, by letting fall a Perpendicular, which muſt lways fall from or upon one of the Ingre-ents, and never from or upon two. For the alculation of any of theſe, obſerve the Rules llowing.

I. The Perpendicular being let down, the two gredients left entire annexed and given, muſt e marked with the Letters, B and BC the ∠ d Side given.

II. One of theſe two, either B or BC, muſt gin the account of the four Ingredients in the ueſtion; and the Perpendicular muſt always ll upon BD extended if need be.

III. If the ∠s at B and D be both acute, then ePerpendicular will fall within the △, and then A = BD — BA, and ∠DCA = ∠ BCD — BCA in the fifth *Fig.* But if the one of B or D b, tuſe, and the other acute, then will it fall with- r, as you may perceive in the 5, 6, and 7 *Fig.* en DA = BA + BD, and ∠ DCA = BCD + CA, as in the ſixth *Fig.* or DA = BA — BD d DCA = BCA — BCD, as in the 7th *Fig.*

IV. The order being begun as before, eithe B or BC,either all four will follow one ano or elſe three of them, and the fourth remo from the reſt.

V.After the Perpendicular be let fall,the S BA, AD, or the ∠s BCA, or ACD, or AC found out, as in rt angled Triangles.

After DA and BA,or ∠ BCA, or ACD,be fo as before,the Triangles are found and perfor by two *Caſes*, and each *Caſe* two Problems

Caſe I. Where all four Ingredients follow other.

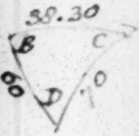
Probl. 1 Leader BC thus, BC, B, BD, and either BD, or D ſought ; As Sine DA BA : : t B . t D.

Probl. 2. Leader B thus,B,BC, BCD,DC, either BCD, or BC, is ſought ; ſay, Coſi. DC Coſi. BCA :: t BC . t DC.

Caſe II. Where three follow immediately one ſeparated.

Probl. 1. Leader BC thus, BC, C, CD, BD, and either DC or BD are ſought ; ſay,C BA . Coſi DA :: Coſi. BC . Coſi. DC.

Prob. 2. Leader B thus, B, BC, BCD, and and either D or BCD are required;ſay,Si.BC Si. DCA :: Coſi B . Coſi D.



Laſtly, in the two *Caſes*, Firſt, where th Sides are given, to find an Angle : For Ex *Fig*. 8. *h*, in the △BCD, let all the Side given *viz*. BC 38, 30 CD 70, and BD and let the Angle C be ſought : Firſt, ſet d the Arith. Compl. of the Sines of BC and including the ∠ ſought. Take the Differenc theſe Sides, and under that diff. ſet down third Side, take their Sum and Difference ſet down their Sines ; laſtly,ſum up all the Sines,the half Sum will find out an Arch am the Sines,which being doubled, will be the

c. 4.

					Si.
BC	38	30	Arith.	Co.	0.205850
CD	70	00	Arith	Co.	0.027014
	31	30	Diff		
BD	60	00	Third Side.		
Z	91	30			
X.	28	30			
Half Z.	45	45		Si.	9.855096
Half X.	14	15		Si.	9.391205
			Sum ——		19479163
			Half Sum		9.739582

Sine of 23° 18', doubled 36 = ∠ C.

And if 3 ∠s be given, to find a Side, if inſtead f the greateſt ∠ you take its Complement to 8°,the ∠s will be Sides & Sides ∠s,as in the laſt.

§4. Of *Longimetry Planometry*, & *Stereometry*.

Note 1 The meaſures uſed for lengths, as you ad them in *Cha*. 2. are either Inches divided to 10 Parts, Feet divided into 100 Parts or 12 ches, a Gad or Rod divided into 10 Feet, nd a Perch or Pole divided into 100 Links, ontaining 16 Feet and a half, or 18 Feet; theſe r any of theſe may be uſed as occaſion requires.

2. Care muſt be had, that in meaſuring any ine or Length whatſoever, you derive not from ſtrait Line; therefore ſet up ſmall Pickets betwixt you and the mark that may direct the ine; or if you meaſure by a four-pole Chain, hen the hindermoſt man look that the Leader o ſtrait, or cover the Mark. If a Line decline, nd you would know the Horizontal Line in oing down a Precipice at the end of the Gad r Rod held Horizontally, let fall a ſmall Stone r any ſmall Weight that will ſhew the Point here you muſt hold Horizontally again.

3. To level a length or Line, or to know what ifference of height in riſing or falling betwixt

place to place, which is a very uſeful Praſi
for carrying of water, or of underground A
or Soughs, take thoſe Rules: Let your Inſtrum
be carefully and truly made, whether it be a W
ter Level, or (which in my opinion is the beſt)
Braſs *T*, the Sights to be two Proſpect Glaſ
which may be had of the *Mathematical-Inſ*
ment-makers about *London*, with Directions
bout it: This kind of Inſtrument will ſuffer
diſtance to a quarter of a Mile, or more if n
be; and there muſt be two Mark-boards pla
on Pike-ſtaves, that your Companions may
up or down as you ſhall direct them.

Set the Level as near as you may in the mi
betwixt the two Marks, which your Compani
hold upright in their hands with the ſlipp
Marks, and firſt turning to one, cauſe him
hold or ſet his Sight even to the level Sig
and ſo the other; the difference betwixt t
Sights in Inches and tenth Parts gives the a
or deſcent; this is for one ſimple Station:
if it require many Stations with aſcents and
ſcents, then in a Note book ſet down your b
Stations in one Column, and your fore Sta
in another, ſum up both the Columns, and t
the difference of them; if they be equal, the t
places are level; if your fore Stations exceed,
the difference is lower; if otherwiſe, higher;
little practice will inform you ſufficiently. In
rying a Stream or River, as the *New Water* f
a little above *Ware* to *London*, or elſewhere,
muſt allow a Foot, or a Foot and two Inches,
a Mile in deſcent, or more, if your fall req
it; and this becauſe of the diſtance of the T
gent from the Surface of the Globe of the E
in every Mile; and tho' in a Mile it will be fo
but 6 Inches, yet it is better to hold to the ſ
ſide. Now for Common Sewers or Paſſage
carry away the Water and Dirt of Streets

Tow

owns ; for every 10 Feet you ought to allow 2
3 Inches as your fall may be, which in every
o feet will be 1 foot 8 inches,or 2 foot 6 inches.
3. For the length of unapproachable Lines,as
oſe of places beſieged,or of heights or diſtances,
y are found by reſolving a Triangle that hath
e ſide, and all the Angles given,as in *Prop.* 4.
Plain Triangles is ſet down,as you may ſee in
. 3. Care muſt be had,that the Angle BCD be
too acute, *viz.* never leſs than 2 degrees,and
refore it will be beſt if the ground will give
ve, to go from B, not in the right Line ABD;
to go off from B towards F at right Angles
For a diverſion,I will give the heights of ſome
ramids, Steeples, Obeliſks, and Pillars, in the
aſure of Engliſh Feet;as when S. *Paul*'s Stee-
had its Spire on,the Stone-work was 260 feet
h,and the Spire as much,which was 520 feet
ll,and will be found as high as any Steeple in
riſtendom, only that at *Cremona* in *Italy* be-
528 feet excepted, the Ball on St. *Peter*'s in
me is 466 Feet ; the Steeple at *Roan* in *Nor-*
ndy is 399 feet ; at *Straſbourg* in *Germany*
feet; at *Landhoven* in *Bavaria* 451 feet;at
dena in *Italy* 279 feet ; the Tower *Aſinel* in
onia in *Italy* 316 feet ; Lanthorn at *Genoua*
4 feet; the higheſt of the Pyramids 1350 feet,
e lower Pyramids 883 ; *Boſton* Steeple in *Eng-*
d,a Stone Steeple without Spire, is 264 feet ;
height of the Obeliſk in *Rome*, (removed by
tano to St. *Peter*'s) was of one Stone 78 feet
d an half high, 9 feet 2 inches ſquare at the
eater end, and 6 feet 2 inches at the top, it
nds now upon a Pedeſtal of 12 feet and an
lf high, and the height of the brazen gilded
oſs is 19 feet and a half, ſo now the whole
ight is 110 feet and an half in all,

4. Before we come to the meaſuring Plains,it
ll be requiſite to ſhew, 1. To raiſe a Perpen-
dicular

dicular from a Line, *Fig*. 9. Suppoſe on
ab = *ac*, open your compaſſes to above hal
and croſs two arches at *d*, *ad* is a Perpendi
2. To do it on the end of a Line, ſtrike an Ar
ſet the ſame wideneſs from *d* to *b*, and ſtrike
ther Arch at *c*, which with a Ruler laid up
and *b* croſs at *c* then is *c a* a Perpendicula
Fig. 10. 3. To let fall a Perpendicular fr
upon the Line *b c*, *Fig*. 11. ſetting one foot
croſs the Line in *b* and *c*, from *b* and *c*, op
the Compaſſes, make a croſs at *e*, lay a Ruler
and *e*, & draw *ad*, which is a Perpendicular
Laſtly, becauſe hereafter there is great uſe
of a Square, I ſhall ſhew you how any *Jo*
skilful *Carpenter* may make one that will
well ſerve your turn for ſurveying or plottin
Grounds, Yards, or Courts, and for meaſurin
ſame. Get a dryed piece of Box or Pear-tree
will bear 3 inches or 3 inches and an half Di
ter, and turn it flat on the top round, with
to fit for the head of a Staff; find the Cent
draw 2 or 3 Concentrical Circles, as you ſee, F
and Circles on the edge, divide the Circle
four Parts, as you ſee in the Figure *a d b c*,
take a Whipſaw very thin, and ſaw by the
the two Lines *a b* and *c d* at the right Angles
deep; this will make a good Inſtrument
ting off Perpendiculars when you have occ

Suppoſe (*Fig*. 13.) *a*, *b*, *c*, *d*, *e*, *f*, *g*, *h*, w
Field, I come to *a*, and ſetting a Becon the
at the corners, I meaſure *a c*, and as I go, f
what length by the ſquare the Perpendicula
xd and *kb* will be, I meaſure all thoſe Perpe
lars, and ſet them down in my Book, I me
cb and the Perpendiculars *mp* and *no*, and
the reſt as you ſee in the Figure; and to la
obſervations down, I do no more but draw
ac by the ſcale, and prick down the points
x, and raiſing Perpendiculars I ſet off 1

and *k d*, which give me *a b c*, *d* and *h*, I draw *c b*, C·4·
and upon it prick down *n*, *y*, and *m*, and ſet off *n o* and *m p*, and ſo I work with the reſt of the Figure, and I deal ſo with the reſt of the Cloſes if there be more, and add all together.

Laſtly, to find the length of a Circular Line, either whole or part, from Degrees and Decimal Parts, may be done by this Table; the first Column are Degrees or Decimal Parts, ſecond Radius is Unity: As for *Ex.* 32° and 16' Dec. Parts; *An.* 56.28 of 100000.

1	.017453292
2	.034906585
3	.052359877
4	.069813170
5	.087266463
6	.004719755
7	.022173047
8	.139626340
9	.157079633

30.52359
2 03491
1.00174
6.00104
.56128

Note II. Planometry, or the meaſuring the ſuperficies or planes of things, is done with the ſquares of ſuch meaſures, as a ſquare foot, ſquare inch, ſquare yard, ſquare perch, that is by ſquares, whoſe Sides are an inch, a foot, a yard a perch; ſo that the *Area* of any ſuperficies is ſaid to be found, when I know how many ſuch ſquare inches, feet, yards, *&c.* it containeth.

1. The *Area*'s of ſquares and oblongs are known, if you multiply one ſide by another.

2. The *Area* of any plain Triangle is gotten by multiplying the Baſe by the Perpendicular, and taking half the Sum, or the Baſe by half the Perpendicular, or the Perpendicular by half the Baſe.

Or without the Perpendicular at all, add up all the ſides and take half the ſum, from this half ſum take every ſide, which call the three Differences, multiply theſe three Differences and the half Sum continually together, the ſquare Root of the laſt Product ſhall be the *Area* of the Triangle.

3. To meaſure any regular Figure that has equal ſides, multiply half the ſum of the ſides by the Perpendicular from the Centre to one of theſe ſides;

To

To find the Perpendicular, conceive a Triangle whereof one Side is the Side given, the Angle op-poſite is the ∠ at the Centre, the other Angles h of its Complement, to find the Perpendicular.

	Q.	L.
△	.658	1.520
□	1.000	1.002
5	1.312	.7624
6	1.612	.620
7	1.904	.525
8	2.196	.455
9	2.487	.402
10	2.769	.361

This Table will preſently give you the Quadratri under Q or the Side unde *L.* for any of the ten Regular Figures, whoſe Side is 1. *Ex.* Suppoſe the Side of a Pentagon be 70.51, wha is the Superficies? Say, As 1. 1.312 ::. 70.51; *Anſw.* 92.52 the Quadratrix, and 92.52.x92.5 =8558. Having the Superficies, take the ſq Root of it, and ſay, As 1. .7624 :: So Q. to Side.

4. The *Area* of any four-ſided Figure, two ſide whereof are parallel, is gotten, if you multiply the Perpendicular from the one parallel ſide upo the other by the half ſum of thoſe parallel ſides.

5. If the figure be of many ſides, caſt them into Triangles, as you may ſee in *Fig.* 13 And if any ſide be crooked, as you ſee *h g* in that *Fig.* draw a Line that ſhall leave as much out as it takes in; or if it be irregular towards a round, as in *Fig.* 14 form a Triangle, as *c h d* that ſhall equal it.

6. The dimenſion of Circles, and other round Figures, are gathered from their Diameters or Circumferences: Let D. ſignifie the Diameter; P. the Periphery; Dq, Pq, the Square of the D or P; l. the Side, as before; ⊙. the Circle; R. Radius, or half of the D. Then

As 7. 22, or 113. 155, or 1. 3. 1415926 :: So is any D. to P; and ſo Dq, to the Superficies of a Sphere; and ſo is Dx the Axis of a Cylinder, to its Superficies; and ſo is half D. into the Side, to the Superficies of a Cone; and ſo is the ſquare of the Chord of half the Segment of a Sphere to the ſuperficies of that Segment.

S. C. 4.

As 22. 7, or 355. 113, or 1.0 :: 3.8310 :: D. ſo Superficies, to the Dq. of the Sphere.

As 7x4. 22, or 14. 11, or as 1 to .785399 : : So Dq. *Area* ; and ſo is the Sq. of the D x l. ſolid Cy-inder ; So Dq x $\frac{1}{3}$ Ax. to the ſolid of the Cone.

As 22. 7x4, or 11. 14, or as 355. 452, or .1.273239 :: So is the *Area* of the ⊙, to the Dq.

As 22 x4. 7, or as 88. 7, or as 1420. 113, or to.079577 : : So Pq. Area of a ⊙, and ſo Pqxl. the ſolid of a Cylinder.

As 1 to 707107 :: D. to the Root of a ſquare be inſcribed in a ⊙. As 1. 886227 :: D. to he Root of a ſq. equal to the ⊙, which is the quaring of a ⊙.

As 1 to .80604 :: D. to the Root of a Cube qual to the Sphere.

As 1 to 1.772454 :: D. to the Root of a Sq. qual to the ſuperficies of a Sphere.

As 1 to .523599 : : Cube of D., to the Sphere.

As 1 to 1.909859 :: Sphere to Cube of the D.

As 1 to .282095 :: ⊙ to Root of a ſquare = to he Area ⊙.

As 7 . 22x4, or 1 . 12.56371 :: ⊙. Pq.

As 1. .225072 :: So is P. to the Root of the nſcribed ſq. in the ⊙.

As 1 to .256556 :: P. to the Root Cube of a olid = the Sphere.

As 1 to .564189 : : P. Root ſq. = ſuperficies f the Sphere.

As 1 to 016887 :: Cube P. to the Sphere.

As 1 . 59.217626 :. Sphere, to Cube of the P.

As 7x6 . 22, or 1 to .5236 :: D. cubed, to he ſolid of a Sphere.

As 22. 7x6, or 1 to 1.90989 :: Solidity to D. cubed of a Sphere.

A Cone, a Sphere, and a Cylinder, that have the me height and Diameter, if the greateſt Circle e equal, are as 1, 2, 3; therefore a Cone is 1 third, nd a Sphere 2 thirds of a Cylinder of the ſame height

height and D. therefore, As 1 to 25.1327 :: D. cubed, to the Cylinder.

7. The Practice followeth. *I.* In ſurvey and meaſuring of Land, meaſure with a P or Pole = 16 feet and an half, divided into parts; then by the aforeſaid Rules, how m ſquare Perches there are, that is the Area of Cloſe or Ground, which divided by 160 ſq Perches (for ſo many are in an Acre = 40 it gives you Acres. the Remainder, accoun 40 Perches for a Rood, are Roods and Perch

This little Table turns Perches into Ac Roods, and Perches, upon ſight; the Num under *ac.* are Ac under *r.* are Ro and under *p.* Perches: The Column are e ſo many Thou under *M.* ſo m Hundreds und or ſo many T under *X.*

	M.			C.			X.	
	ac.	*r.*	*p.*	*ac.*	*r.*	*p*	*r.*	*p.*
1	6	1	0	0	2	20	0	10
2	12	2	0	1	1	0	0	20
3	18	3	0	1	3	20	0	30
4	25	0	0	2	2	0	1	0
5	31	1	0	3	0	20	1	10
6	37	2	0	3	3	0	1	20
7	43	3	0	4	1	20	1	30
8	50	0	0	5	0	0	2	0
9	56	1	0	5	2	20	2	10

As for Example: 7854 Perches are gi which I ſet down as you ſee, and take the ber of Acres, Roods, Perches, anſwering ea gure, and it makes in 49 Acres and 14 Per Sometimes as in ſmall B ſides, Courts, or other places, the meaſure ma by the Foot, and then Table turns any number of Feet into Ac Roods and Perches, at the firſt view, to be op ted with Feet, (as the laſt *Ex.*) Roods, Per

	ac.	*r.*	*p.*
7000 —	43	3	0
800 —	5	0	0
50 —	0	1	10
4 —	0	0	4
	49	0	14

	CM.				XM.				M.		C.	
	a.	*r.*	*p.*	*f.*	*a.*	*r.*	*p.*	*f.*	*p.*	*f.*	*p.*	*f.*
1	2	1	7	86	0	0	36	189	3	183	0	100
2	4	2	14	171	0	1	33	126	7	94	0	200
3	6	3	21	257	0	2	30	53	11	05	1	28
4	9	0	29	70	0	3	25	252	14	189	1	128
5	11	1	36	156	0	0	23	179	18	99	1	228
6	13	3	3	240	0	1	20	100	22	11	2	56
7	16	0	11	54	1	2	17	33	25	194	2	156
8	18	1	18	145	1	3	13	232	29	106	2	256
9	20	2	25	225	2	0	10	159	33	17	3	84

the numbers under feet are odd feet;the ſecond Column is one Hundred Thouſands, the third Tens of Thouſands, the fourth Thouſands,and the laſt Hundreds.

One Superficies is to another as the ſquares of their likeSides;therefore, As the ſquare of 8.5,to ſq.of 16.5;or, As the ſq of 12 (= 144) to the ſq.of 11 (= 121):: So are the Content in Statute Acres,to theContent in Woodland.And, As 144 to 196 :: So Foreſt Acres,to Woodland Acres. And, As 121, to 196 :: So Foreſt Acres, to Statute Acres.

II. In meaſuring of Pavings, Plaiſterings, Wainſcotings, and Paintings, you uſe the Yard ſquare; or if you meaſure by feet and tenth parts, then every 9 feet ſq. makes a yard, all of them require the whole ſuperficies, therefore you muſt meaſure wherever the plane or bruſh goes. The Paviers muſt lay good Foundations, and ram well; the Plaiſterers work with good Materials and Size; the Wainſcoting well wrought;and the Painters to lay a good Ground, and work with Oyl and White Lead

*III.*Carpenters work,as Flooring,Partitioning, Roofing, and ſo Tiling, Slating, nay, lately in *London*,the Ground-plot of whole Buildings,are meaſured by the ſquare of 10 feet = 100 ſq feet; ſo that if you meaſured by a 10 foot Rod, and every

every foot divided into 10 parts,all will come into feet, and cutting off the two laſt figures, th Remain will be Flores or ſq of 10 = 100.

Brickwork is meaſured by the Perch of 16 fe and an half,the beſt way is to Meaſure by the 10 foot Rod laſt ſpoken of,and caſting up the Ar by multiplying one ſide by another, it will produce ſq. feet, which by this Table is preſentl brought into ſquare Perches. The firſt Colum are Feet,or Thouſands or Hundreds,or Ten Fe as the either ſo many X.M. ſecond, third, four and fifth Columns anſwer.

	XM.			M.			C.			X.	
	p.	q.	f.	p.	q.	f.	p.	q.	f.	q.	f.
1	36	2	63	3	2	41		1	31		10
2	73	1	58	7	1	26		2	62		20
3	110	0	53	11	0	5	1	0	26		3
4	146	3	55	14	2	52	1	1	57		40
5	183	2	40	18	1	31	1	3	20		50
6	220	1	35	22	0	10	2	0	52		60
7	257	0	43	25	2	57	2	2	14	1	2
8	293	3	41	29	1	36	2	3	47	1	12
9	330	2	25	33	0	15	3	1	10	1	22

Exam. In 36542 ſquare feet, what perch quaters,and feet ? *Anſ.*134 perches,0 q. 57 fe

30000	110	0	53
6000	22	0	10
500	1	3	20
40			40
2			2
	134	0	57

This ſuppoſeth that th brickwork is brick a half thick,but if the wa be more or leſs thick, a count it by half bricks, a 3 for brick and half, 4 f 2 bricks,6 for 3 bricks & and ſay,As 3, to any oth wall in half bricks :: So are the perches fou by meaſure, to the perches to that other wa in half bricks. *Note*, That 272 one quarter o ſquare feet is a perch, 68 one quarter, 136 ha and 204 three quarters.

Tapeſt

C·4·

apeſtry is meaſured by the Stick = 27 inches quarters of a yard, in a Stick = 729 ſquare es. This Table gives *Sticks*, *Quarters*, and *es*, anſwering to any number of *Square es* meaſured by *Inches*.

	XM			M			C	
	s.	*q*.	*inch*.	*s*.	*q*.	*inc*.	*q*.	*inc*.
1	13	2	159	1	1	83		100
2	27	1	135	2	2	177	1	18
3	41	0	112	4	0	84	1	118
4	54	3	89	5	1	172	2	36
5	68	2	65	6	3	79	2	136
6	82	1	41	8	0	168	3	54
7	96	0	19	9	2	74	3	154
8	109	2	176	10	3	163	4	72
9	123	1	153	12	1	70	4	172

ard, Glaſs, &c. are meaſured by the foot, ed into 10 or 100 parts, or by inches and arts, and then this Table will turn the

	M.			C.			X.	
	f.	*q*.	*inc*.	*f*.	*q*.	*inc*.	*q*.	*inc*.
1	6	3	28	0	2	28		10
2	13	3	20	1	1	20		20
3	20	3	12	2	0	12		30
4	27	3	04	2	3	04	1	4
5	34	2	32	3	1	32	1	14
6	41	2	24	4	0	24	1	24
7	41	2	16	4	3	16	1	34
8	55	2	08	5	2	08	2	8
9	62	2	00	6	1	00	2	18

s Square into *Feet*, *Quarters*, and *Inches*, ſq inches = 68 f. 1 *q*. 14 *in*.

	f	*q*.	*inc*.
9000	62	2	0
800	5	2	8
40		1	4
2			2
	68	1	14

In

In ei her Board or Glaſs,if the breadth be ven, to find how much of that breadth make a foot in length. Divide 1 by the brea in feet and 100 parts, the Quotient givs par a foot; if by inches, divide 144 (12 x 12) inches and parts.

If you meaſure by inches and 8 parts in Figure adjoyning, you may turn them in and 10 parts by inſpection, the two middle being inches and 8 parts, above you have and 10 parts, below Timber meaſure.

Note III. Stereometry, or meaſuring of dies, has two Multiplications or three Dim ſions, and is valued by the Cube of ſome fam meaſure; as an inch Cube, a foot, a yard, or pe Cube.

5

A perfect Cube is known, by multiplying ſide into it ſelf, and that product by the again.

A Parellepipidon, or an oblong Cube, a ma, or a Cylinder or Pillar; firſt, get the ſu ficies at the end, and multiply that by the he or perpendicular, from the top of the body the plane below.

A Pyramid or Cone is meaſured by the ſu ficies of the Baſe, multiplied into one third the height.

The five Regular Bodies, *viz.* Tetrahedr Cube, Octohedrum, Dodecahedrum, and Ic hedrum, are meaſured as in the Table. Say,

	Cube.	*Side.*
Tet.	.490	2.040
Oct.	.778	1.285
Cube	1.000	1.000
Icoſ.	1.318	.771
Dod.	2.003	.507

As 1 . ſide of the Dod::
.778 . Cube.
As 1 . Cubat. of the Dod
So 1.285 . Side.

The Cubatrix multip into it ſelf twice, gives Solid, and is the Cube R of that ſolid body.

7

To meaſure the Fruſtums or parts of Py

s or Cones, (as tapering Timber is) ſupply c·4.
Pyramid or Cone, ſaying, *As* differ. of the
dth at the two ends, *To* the length between
m:: *So* the breadth of the greater end, *To*
whole length of the Pyramid or Cone.

his gives you the length of the top part; find
efore the ſolidity of the top-part, and the
le ſeverally, ſubſtract the ſolidity of the top
n the whole, leaves the ſolid. of the Fruſtum. 7

ana found the Obelisk, by him removed to
Peters, to weigh 529 Tuns, 11 Hundred, 2
rters, and 3 pound, Averdupois. 7

he uſual way for this tapering Timber, is to
ſure the ſuperficies in the midſt, and multiply
the length, which though is be a falſe Rule,
it it be done at many lengths, ſuppoſe at
y 5 or 6 feet, it will be very near.

ll bodies one to another are in proportion as
Cubes of their like Sides

he meaſuring of all bodies that have curved
rficies, or plain-curved, follows.

pheres, Cylinders, and Cones, you have their
enſions and meaſures amongſt the dimen-
s of Circles and round Figures in Plainime-
y.

o meaſure the Truncus or part of a Cylinder
leans, take the ſuperficies of the Circle, and
ing the longer and ſhorter ſides of the Trun-
take half, let that be the height.

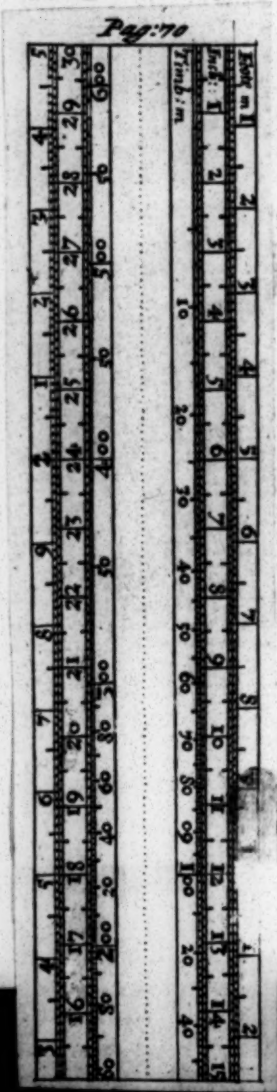
he ſector of a Sphere is meaſured, by mul-
ying its ſuperficies ſpherical by one third of
height.

he ſegment of a Sphere, meaſure it as if a
or, and ſubſtract from the Sector the ſoli-
of a Cone, whoſe Apex is in the Centre,
Baſe the Area of the Segment.

he ſolidity of a Spheroid is gotten, by multi-
ing the greateſt Circle into two thirds of the
s about which the Spheroid is made.

The

The ſolidity of the Trunk of a Spheriod off with two Circles at right Angles with Baſe, ſuch as our Wine Cask are, is gotten, adding two thirds of the Area of the Circle the bung or middle, and one third of the A of the Circle at the head together, and mu plying the ſum by the length.



The ſolidity of an tuſeParabolical Conoi gotten by multiplying the Area of the circ Baſe in half the Axis, of an Aeute one into e fifteens of the heigh

2.The practice of m ſuringSolids follows for meaſuringTimbe Stone by the foot divi into 10 or 100 parts, tiply as beforetaught Anſwer will be in feet decimal parts;and if meaſure by inches an parts, you may put meaſure into feet and cimal parts by the Ta annexed.But if your meaſure by inch meaſ caſt all up in ſolid inc and then by this Ta find the ſolid feet, qu ters and inches.

324	3 *qu.*
216	2 *qu.*
108	1 *qu.*

If any piece of rou or ſquare Timber be

w

n, and it be deſired what length of it will make C·4
oot, divide 1728 by the inches ſquare at the
l, it anſwers the Queſtion.

But if you have
e ſuperfic. Con-
t at the end
he Timber or
ae, and deſire
know the ſo-
ity of one foot,
Table fol-
ving will give
ou quickly.

	X M.			M.			C.	
	f.	*q.*	*in.*	*f.*	*q.*	*in.*	*q.*	*in.*
1	5	3	64	0	2	136	0	100
2	11	2	128	1	0	272	0	200
3	17	1	192	1	2	408	0	300
4	23	0	256	2	1	112	0	400
5	28	3	320	2	3	248	1	068
6	34	2	384	3	1	384	1	168
7	40	2	16	4	0	88	1	268
8	46	1	80	4	2	224	1	368
9	52	0	144	5	0	360	2	036

Exam. A piece of
mber at the end is
6 ſquare Inches,
at Timber in one
t in length. *An.* 5
t 3 quarters in e-
y 12 inches.

800 — 5.555
30 — .208
6 — .041

5.804

This Table is of Excel-lent Uſe.

In Feet & Pts.	
1	.00694444
2	.01388888
3	.02083333
4	.02777778
5	.03472222
6	.04166666
7	.04861111
8	.05555555
9	.06250020

In the laſt figure upon the edge you have a
e called *Timber Meaſure*, by which, and the
gth of any ſquare Timber, you may find the
tent; thus in ſtead of the ſide of your Timber
inch meaſure and parts, take that of this
ne, and multiply that by the length gives the
aſure.

The *General Rule* for meaſuring of Timber
t is not ſquare at the ends, is to add both the
es, and take half for the ſide of the true ſqu.
t this is Erroneous, and ſo much the more as
the

the ſides are more unequal,therefore the A the end is to be taken. The other Error is in ſuring round Timber by girding it, and ta one quarter for the ſide of the Square equ let it be what it will, you muſt take ſuch m ſures as the Country uſeth.

Earth-work,as Cellars, Vaults, *&c.* are m ſured by the Yard-ſolid, *viz.* 27 ſolid feet, ſo much ought to be a Cart load,and will be c tained well; the Carts ought to be 2 feet 8 inc broad at the Axle-tree within, 2 feet high, a 5 long.

All Banks that are made to hold out the S or Rivers,and all Ramperts,Perapets and M and New Rivers,are wrought by the Flore,c ſiſting of 18 feet ſquare and one foot deep,wh is 324 ſolid feet,which are 12 Cart-loads,the

	XM.			M.			C.		
	Fl.	*qu.*	*fe.*	*Fl.*	*qu.*	*fe.*	*Fl*	*qu.*	*f*
1	30	3	37	3	0	28	0	1	1
2	61	2	74	6	0	56	0	2	3
3	92	2	30	9	1	03	0	3	5
4	123	1	67	12	1	31	1	0	7
5	154	1	23	15	1	59	1	2	1
6	185	0	60	18	2	06	1	3	3
7	216	0	16	21	2	34	2	0	5
8	246	3	53	24	2	62	2	1	7
9	277	3	09	27	3	09	2	3	0

	Fl.	*qu.*	*fe.*
7000 —	21	2	34
800 —	2	1	17
57 —	0	0	57
	24	0	27

lidity being caſt up ſolid feet,this Table ſhe the *Floors uarters,* a *Feet*; 7857 ſolid feet w make 24 Floors, as y may ſee in this Exampl

For meaſuring Ships, multiply the length the Keel,the breadth of the Mid-ſhip Beam, a the depth of the Hold, together, divide by

ves you the Turns, or inſtead of the depth it C·4·
ual to take half the breadth inſtead thereof :
or Merchants that allow nothing for Guns,
s, *&c* divide by 95. This may give a gueſs
e Tunnage, but there is a great deal more
ired to give the true meaſure of a Ship, or
urthen ſhe will bear in ſalt water, for in
water the Ship will ſink more.

o double a Cube, or to give the Cube Root
Cube that ſhall be double to another given,
le the Cubick Inches and parts of the Cube
n, extract the Cube Root ; and thus by
ing the meaſures of the Ship of one bur-
, to make another Ship of the ſame mould
h ſhall be double, treble, *&c.* or any pro-
on more or leſs, multiply the meaſure of
length, breadth, and depth in ſolid feet, then
le, treble, *&c.* the feet, and extract the Cube
t.

he next thing is concerning the ſolidity and
portion in Weight, ſeveral Metals, Minerals
Water, have one to another.

ote IV. Concerning Metals, and of the ma-
d uſes of the Table, *page* 17.

If you have the magnitude of any body in
inches, and deſire to know the weight of it
roy ounces: As 1 is to the number of Ounces
Decimal Parts anſwering the Metal, Stone,
in the Table A : : So is the Cubick Inches
n, to the Ounces in weight required.

If you have two ſeveral Bodies named in
Table, both of the ſame magnitude or capa-
together with the weight of one, to find
weight of the other : As the number in the
mn A anſwering the firſt, to the number
e ſecond : : So the weight of the firſt, to
weight of the ſecond.

The uſes of the Column B are likewiſe

two ; 1. To know the magnitude in Inches any Body by the weight in Ounces : As 1,to inches and parts in the Column of the Me &c. propoſed : : So the weight given, to inches in magnitude ſought.

4 Two ſeveral Metals, Stones, &c. both one weight, and the bigneſs of one in inche ſay, As the number in Column B ſtand againſt the firſt, is to the number againſt ſecond : : So is the magnitude of the firſt, the magnitude of the ſecond in inches.

5.The uſes of the Column C ſhews the wei that every inch of the ſeveral Bodies will we in water. From *Archimedes* we may ſay, T all Bodies let into water, are either hea equal, or lighter, than ſo much water equal magnitude ; if heavier, then the body will ſi if equal, then the bodies utmoſt ſurface will li even with the top of the water ; if lighter ſo much of the body will ſink into the wat as the quantity of water which might be e in bulk to ſo much body as ſhall ſink, ſhall we equal to the weight of the whole body posed. Again, a body heavier than wate lighter in water when weighed, by the we or ſo much bulk of water equal to that bo Hence it is eaſie to diſcern the weights of ſe bodies in and out of water by the Col A and C, A is the weights in Air, C in w where it is plainly ſeen, that Gold being ſc the half quantity of Silver or Braſs doth ſcarc half ſo much of its weight as Silver or Braſs and from this conſideration *Archimedes* ju of King *Aiero*'s Crown. By the Colum As 1 is to the number anſwering the body; is the ſolid inches of any body given, t weight in water.

Now it will be convenient to give you Tables for converting ſolid inches into we of water Averdupois.

the firſt rns ſolid nches of ater into unces A- erdupois. he ſecond rns oun- s Averd. water in- ſolid Inc.

C. 4.

	(1.) Averdupois Ounces.		(2.) Inches and Parts.
1	0.579522	1	1.72555
2	1.159044	2	3.45112
3	1.738566	3	5.17668
4	2.313088	4	6.90224
5	2.897611	5	8 62780
6	3.477133	6	10.353 6
7	4.056655	7	12.07892
8	4.636177	8	13.80448
9	5.215699	9	15.53004

Example. In an Ale-Gallon = 282 ſolid inch- , how many ounces Averdupois?

Anſw. 163 ounces.426 = 163 ounces .426. So in 500 ounces of wa- , there is 862.78 ſolid hes by the (2)

And in a foot ſolid, there ll be anſwering 1728 ſolid inches, 62 l. 9. oun- s 414.

By the (1.)
200--115.904406
80-- 46.361776
2-- 1.159044
163. .426

The neareſt proportion in Troy weight, that ſolid inches will hold 19 ounces Troy of wa- , and one pound Troy of water will fill .7368 inches, and one pound Averdupois 609. A foot ſquare of water is equal to 76 und Troy.

Hence is found a very good way for meaſu- g any irregular body, that by no Mecanical otherwiſe can be done. Fill any Veſſel brim l of water, and then dipping in your body, eive carefully all the water that runs over, d weigh it, and by the laſt two Tables turn t weight into ſolid inches. Otherwiſe, if r Veſſel be regular that holds the water, ob- ve the riſing of the water, and find the ſolid t or inches anſwering.

Hence it is, that expert Builders of Ships have at conſideration of all the premiſes in this

Section, for by the weight of the Ship, and a Appurtenances, they judge to what depth will ſink; and herein the ingenious Sir *Anthon Dean*, one of His Majeſty's Commiſſioners of th Navy, has exerciſed abundance of Skill, thoug for all the Art one can have, long experience a good judgment will be required, for as I had from the ſaid Sir *Anthony Dean*, that the propo tion betwixt dryed Oak and freſh Feld, is as to 17, So that conſidering the ſtrange forms the Bodies of Ships, and many ſuch and more a cidents, as that before of Oak wet and dry, it is difficulty inſuparable, to give to an inch the dep a Ship will draw when rigg'd and fitted out.

Laſtly, if it be propoſed to make a piece of Ir ſwim in pure water, you muſt make it ſo hollo that it may be capable to hold as much wa that will be equal in weight to the Iron a ſomething more.

Note V. Of Gauging of Veſſels. The Gall which is the ground for this Work, take as is now allowed and uſed; Gallon for dry me ſure is 272 ſolid inches and a quarter; for Wi 231; for Beer and Ale 282.

		XM.			M.			C.			X
		g.	*p.*	*in.*	*g.*	*p.*	*in.*	*g.*	*p.*	*in.*	*p.*
I. Sol. Inches into Wine G.	1	43	2	9	4	2	18		3	13	
	2	86	4	1	8	5	7		6	26	
	3	129	6	27	12	7	26	1	2	11	1
	4	173	1	8	17	2	15	1	5	24	1
	5	216	3	17	21	5	5	2	1	9	1
	6	259	5	26	25	7	23	2	4	23	2
	7	303	0	6	30	2	11	3	0	6	2
	8	346	2	16	34	5	3	3	3	19	2
	9	389	4	25	38	7	20	3	7	5	3

C.4.

Inc. into Beer and Ale G.

	XM g.	p.	*in*	M. g.	p.	*in.*	C. g.	p.	*in.*	X. p.	*in*
1	35	3	24	3	4	13	0	2	29	0	10
2	70	7	13	7	0	26	0	5	23	0	20
3	106	3	2	10	5	3	1	0	18	0	30
4	141	6	26	14	1	16	1	3	14	1	4
5	177	2	15	17	5	29	1	6	5	1	14
6	212	6	4	21	2	7	2	1	0	1	24
7	248	1	28	24	6	29	2	3	30	1	34
8	283	5	17	28	2	33	2	6	24	2	8
9	310	1	6	31	7	11	3	1	18	2	18

Inch into dry Meaſure.

	XM g.	p.	*in*	M. g.	p.	*in.*	C. g.	p.	*in.*	X. p.	*in*
1	36	6	4	3	5	14	0	2	32	0	10
2	73	4	8	7	2	28	0	5	30	0	20
3	110	2	12	11	0	8	1	0	28	0	30
4	147	0	16	14	5	22	1	3	26	1	6
5	183	6	20	18	3	2	1	6	24	1	16
6	220	4	24	22	0	16	2	1	22	1	26
7	257	2	28	25	5	30	2	4	20	2	6
8	294	0	32	29	3	10	2	7	18	2	12
9	330	7	2	33	0	24	3	2	16	2	2.

So that by theſe three Tables, if you caſt up Content of any Meaſure or Caſk into ſolid hes; you may eaſily find the Galions un- g. Pints under *p.* and Inches under *in.* er for Wine by the firſt, Beer and Ale by ſecond, and dry Meaſure by the third. Example for all :

Wine, ſuppoſe 9845 hes, it will make 42 lons, 4 Pints, and 26 es.

	g.	*p.*	*in.*
9000 —	38	7	20
800 —	3	3	19
45 —	0	1	15
	42	4	26

hus for all Buſhels, s,and all other Mea- s in Cylinders, get Area of the Circle in Inches, and multi-

ply

ply it by the length, it gives the ſolid Inches the Area, ſay, As 1 . 0.78539 : : So Dq . A
Or eaſily by the Logarithm, Add the Log. of
Diameter doubled, to this Log. 9 .895085, it gi
you the Area deſired : But in meaſuring
Spheroid or Hogſheads, and other Veſſels
figured (as you were taught before) you m
take two Thirds of the Area of the Circle
the Bung.

Viz. As 1 . 0.5236 : : So Dq to two Th
of the Area.

And, As 1 . 0.2618 : : So Dq. to one Th
of the Area.

The Logarithm for two Thirds is 9 .71
for one Third 9 .417969, to be uſed as befo

If you will not meaſure by Inches, but
Gallon Rod, you muſt take the Cube Roo
272,25, of 231 and 282, which are 6.481, 6.
and 6,557, and making Scales of Gallons
theſe Meaſures by Compaſſes taken from a
gonal Scale of an Inch, upon your Ruler ex
and divide the ſame into 100 Parts, ſo is
Rod fitted to meaſure by Gallons and 100 P
Ex. A Veſſel at the Head by the Rod 3 Ga
whoſe ſquare is 9, at the Bung 5, 5, whoſe Sq
is 30.25, ſay As 1 . 9 : : 2618 . 2.336 = one
of the Area; and, As 1 . 30.25 : : .5236 . 15.
two thirds of the Area at the Bung ; and
4 15, 839 = 18.145 : Now 18.195 x 6.
length, produceth 123.73, that is, 123 Ga
and almoſt 6 Pints.

Here is a Printed Figure has all the 3 L
Wine Meaſure, Beer and Ale Meaſure, and
Meaſure ; the firſt two are one third of
Area's, the laſt for Cylinders is the whole A
on either edge is a Line of 8 Inches, every
into 10 Parts, the Scale is broken into 5
which make 40 Inches ; by an Example i
be plain.

A

Veſſel of Wine, at the head 18 inches, at C·4.
bung 32 inches, length 40 inches.
ſeek 18, I find it in the ſecond Row 3642, and
in Wine Meaſure ; for a third, againſt 32.

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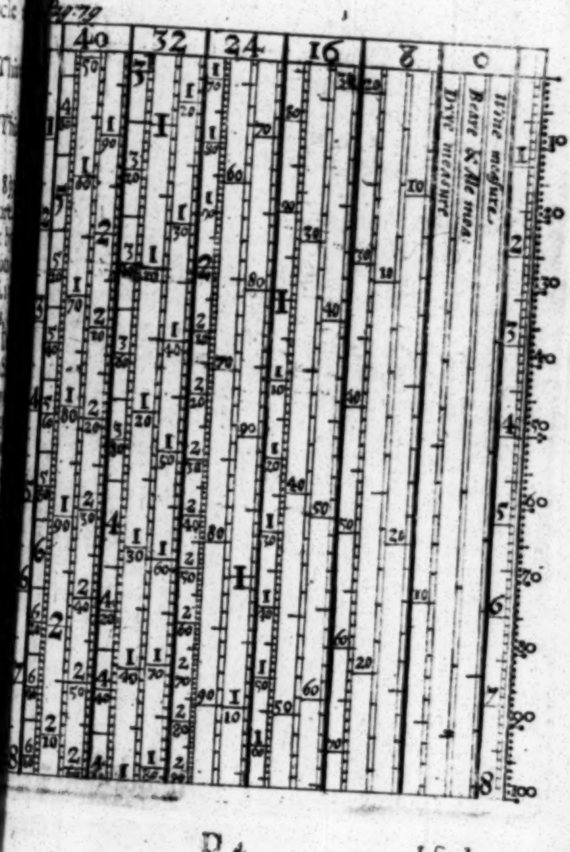

I find

I find 1.16, which doubled gives 2.32; m
.374 2.32 = 2.69 x 40 = 107.60, which is 1
Gallons and an half.

For Dry Meaſure take the whole Area, b
cauſe of Cylinders.

At the later end of the Book I have inſert
Mr. *Philips* his Table for the Gaging of W
Casks that are not full, it is made to Gallons a
half Gallons, and by proportioning may go ne
er. Find the Content of the whole Cask, and fi
how deep the Liquor is within the Cask; ſay,
the Diameter at the bung in inches, to the dep
of the Liquor :: So the Rad. of the Table 100
to the Proportional Part. Find in the Table t
Gallons and Parts that anſwer that Part Prop
then ſay, As 63 Gallons the Gallons of the Ra
is to the proportional Gallon found :: So is t
Content of the whole Cask, to the Content
the Liquor in the Cask.

§. 5. This Parapgrah ſhews Rules of Practi
1. In the Embattelling and Ordering of Soldi
2. In the Quartering and Encamping; 3.
Fortification; and, 4 In Gunnery

1. Though this Curioſity to a skilful Sergea
Major will not be material, yet to a young beg
ner, and even to the better practiſed Soldier,
will be helpful.

To order Soldiers into a ſquare Battle of M
take the ſquare Root of the Number, that ſh
be the ſide both for Rank and File: But if th
be to be ordered into a double Battle, take t
ſquare Root of half the Number, and that will
the number in File, and twice ſo many in Ra
and if it be demanded to order them for tim
as many in Rank as in File, take the ſqu
Root of a fourth part.

To order them into a ſquare Battle of groun
you may diſtinguiſh them into Order and op
Orde

C.4.

der: Order, when the Centres of their places e diſtant 3 feet and an half in Rank, and 7 in le; open Order, when the Centres are 7 feet th ways If it be a ſquare Battel of Ground, d the Centre of their Diſtances in Order, then s 1 . 2 : : So the Number of Men, to another umber, whoſe ſquare Root is the Number of en in Rank: So by the help of extracting of a uare Root, theſe ſort of Queſtions are eaſily ſolved

2 For the Quartering and Encamping of Sol-er, called *Caſtramentation*, it is requiſite the uarter Maſter General be skilled in Meaſuring, d all the under Quarter Maſters ought to be ill'd at Foot Meaſure, that they may lay out eir Quarters as directed.

Three hundred feet is the common Allowance the depth of ground that a Regiment, whether Horſe or Foot, ſhould take up, the wideneſs uſt be anſwerable to the number of Men Two ndred feet for the Huts in length, and one hun-ed for the Commanders and Sutlers before em; every two Soldiers to a Hut 8 feet broad d 8 deep, two feet one Hut from another, ſo at there may be 20 Huts ſtand in the 200 feet; e Alley betwixt Hut and Hut may be 8 feet, at is, 16 feet in width and 200 in length for -men, which is 3200 feet, and for the 100 feet ore 1600 feet, in all 4800, and there muſt be Rows for 100 Men; ſo that for a Regiment 1000 Foot, with Officers and Sutlers, will e up 120000 feet, which by the Table afore-ing, for turning Feet ſquare into Acres, will be *a*. 3 *r*. which, becauſe of ways, may be made *a*. of Ground for every Regiment, which may 350 feet deep, and 370 wide, or near 360 uare.

Now if 1000 Men, Officers, Sutlers, High-ays and all, take up a ſquare of 360 feet, how many feet ſhall the ſide of a ſquare be,to lod 10000 Foot Men? *&c.* Say, As 1000 . 10000: is the ſquare of 360 = 129600, to the ſqua 1296000, whoſe Root is the feet requir *viz.* 1138 feet, which is very near 30 Acres Ground.

For Quartering of Horſe, you muſt keep t ſame depth of 300 feet for all, and take 200 fe for the Huts, the Horſe Huts muſt be 10 fe deep and four wide, 12 Horſes will ſtand a Hut together, which is 48 feet long and wide, and 6 feet a Street; the Huts for th Troops will be 6 for 12 Troops, and ſo imagi a Regiment conſiſt of 8 Troops, 50 to a Troo it will take up, leaving 20 feet Streets and Cro ways, very near as much Ground as the Reg ment of Foot, ways and all, 360 feet = 3 Acr ſo that 10 Regiments will take up 30 Acre You may very well allow as much ground, both Horſe and Foot will take, for the Gener Train of Artillery, Victuallers, *&c*, and Para places; ſo that 120 Acres will well Camp 15 Horſe and Foot, and all Proviſions beſid From theſe Conſiderations, you may be enabl to Encamp an Army.

Note III. Concerning Fortifications; by c ſtom and uſe (neither great nor ſmall Shot brin ing ſuch danger as the Fear) Forts and Fortifi tions are leſs conſiderable, and are taken in ſhort time; therefore the late Engineers ha thought it to lay open the Flanks, and to diſp the Works, ſo as they may receive more Ca non, that the Enemy may be kept-back fro approaching too faſt, for all that can be done to get and obtain time.

I have dot room to enlarge, you may per *Modern Fortifications*, and there you may fi ſeveral Varieties.

I wi

will ſet down theſe two Tables, and their s,which are ſo ſhort and plain,and will be at d, that more ſhall not be needed, ſuppoſing Reader already ſeen in the Rudiments of Art.

ble I.	Capital,	Gorg	Flank,	Curtain.
	333	200	150	600

ble II.	4	5	6	7	8	9	10
pital.	398	437	367	333	312	300	291
r. Li.	155	196	203	242	252	260	363

Both the Tables ſuppoſeth the Interior Poly-nto be divided into 1000 Parts. Then if you ire that the Flanks ſhall ſtand at right Angles th the Curtain, then by *Table I* if your Figure an Hexagon, divide *p p* (*Fig.* 16) into 1000 rts, make *p a* 333, *p c* 200, and raiſing *e f* at ht Angles to *p p*, make it 150, draw *f a* the ces,and *c c* the Curtain,you may compleat the ork: But if you will not make the Flank at ht Angles to the Curtain, but open it a little, d have no ſecond Flank, according to *Travaux Mars*, ſet off the Capital and Gorg. as before, iſe the Flank at 98 degrees to the Curtain,and ying your Ruler on *a*, *&c.* draw the Faces.

Note: That this Proportion is one Third of Interior Polygon for the Capital, and if you e one Fifth or one Seventh for the Gorg. and nk, it will be well.

The ſecond way ſets the Flanks at right Angles the Lines of Defence. For *Example:* In g. 17 let it be an Heptagon, divide the de into 1000 parts, look in *Table II.* under 7, t off 333 for the Capital, and 242 for the orges, draw occult Lines from *a* to *c*, which e the Lines of Defence, and raiſe Perpendicu-ars from the Points *c*, and draw *c f* for the Flanks, Flacks, and *f a* for the Faces; this being w underſtood, may be applied likewiſe to Irreg lar Figures.

The fourth and laſt *Note* concerns *Gunne* or the Qualifications that able Gunners ought have.

Firſt, He ought to have competent Skill *Arithmetick*, to keep his Accounts fair, and enter in his Diary all notable Shots and Occu rences in his Art, to be able to caſt up the qu tity of Powder fit for each Piece, the weight Shot of all ſorts. whether Lead, Iron or Ston to work the Golden Rule in Proportions, to e tract the Cube Root, which are formerly taug in this Book: He ought to have Skill in *Geom try*, to take Heights and Diſtance, to know t Diviſions of his Circle, Quadrant, and Quadra to know how to Level, and to lay Platfor and to raiſe Batteries; and though ordina Gunners may be excuſed from all this Kno ledge, yet Maſter-Gunners, and thoſe that de to be knowing in this Profeſſion, muſt not be of be ignorant.

He muſt know his Piece and Name, which a taken from the height of the Bore, as in this f lowing Table annexed, which gives in the fi Column the Names of the Pieces; next, t weight of fortified Guns; the third, the heig of the Bore; the fourth, the height of the Sh the fifth the weight of the Shot; the ſixth, Po der for Proof; the ſeventh, Powder for Servic the eighth, Paces (5 foot to a Pace) the Pi ſhoots point-blank upon the Level; the nin the utmoſt random the Pice mounted to 45 grees; the tenth, the Horſes; and the eleven the Men required to draw a Piece.

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c.4

Names.	Guns weight.	Height bore.	Height ſhot.	Weight of ſhot.	Powder for proof.	Powder for ſervice	Paces point Blank	Utmoſt Random.	Horſes to draw.	Men to draw.
	C			li.	lib.	li.				
Can. 8.	70	8	7.57	63	28	23	180	1800	18	100
Can. 7.	604	7	6.75	42	24	18	180	1800	16	80
Dem C.	504	6.3	6.05	32	20	15	180	1800	12	60
24 l.	404	5.87	5.62	24	17	11	180	1810	10	50
Culv.	40	5.32	5.07	18	14	10	184	1840	8	50
12 l.	35	4.46	4.64	12	10,5	8	178	1780	6	40
Dem.C.	30	4.25	4.03	9	9	7	175	1750	6	35
Saker.	20	3.58	3.40	5 1/4	5,25	4	160	1600	4	25
Minion	12	3.35	3.18	4	4	3	120	1200	3	16
Falcon.	5	2.68	2.54	2 1/2	2	1.5	120	1200	2	10

Next he muſt learn from ſome Gunner the ants of a Piece of Ordnance, the *Caliber* or eight of the *Bore*, the *Hollow Cylinder*, the *hamber* from the touch-hole to 2 feet or 18 ches where the Powder and Shot lie, the upermoſt part next the Breech is the *Baſe Ring*, hoſe Rings from whence the Piece grows leſs e called the *Freezes*, the uppermoſt of the Mel or *Freeze* at the Mouth is called *Muzzleing*; thoſe two knobs that hold the Piece in e Carriage are the *Trunions*, the thickneſs of e Metal is commonly meaſured at the Touchole, the Trunions, and the Neck: And all theſe the meaſure of Ladles, the length and the ickneſs, and bigneſs of the Carriage, the Truons and many other things, were formerly tan from the height of the bore. He muſt alſo be be ready at all the Names about the Carriage of his Piece, *viz.* to know the Sides or Cheeks, the Axtree, Spokes, Nave, Hoops, Tranſomes, Bolts, Plates, Hooks to draw by, the Clout, the hole for the Linſpin, the Shafts, the Thill and Thill-bolt, the Fore-locks and Forelock Keys, Cap ſquares, the Fore-lock Pins and Chain, the Pintle and Bolt-hole, the Fellows, Nayles, Bars over the Fellows, Stirrops, the Ruts of the Wheel, Dowledges, Beds, Coins, Levers, Handſcrews, *&c.* and to have ready his Ladles, Spunges, Cartridges, whether of Paper or Canvas, Formers of all ſorts, Sheep-skins to make Spunges, Powder, Shot, Needles, Thread, Starch, Marlyn, Twine, Nails, Handſpikes, Crows of Iron, Budg barrels, Baſkets, *&c.* Theſe being the General things he is to know and have ready, he is in particular.

1. To *Tertiate* his Gun, that is to know the thickneſs of the Metal, at the Touch hole, Trunion and Neck, by which you judge at the ſtrength of the Gun, whether well fortified or no, this you do with a Coliper pair of Compaſſes, and if the Piece be home bored, the Diameter leſs by the height divided by 2 is the thickneſs at any place, he muſt ſearch his Gun for honey-combs with a ſearcher, or by reflection of a Looking-glaſs, that the Trunions be well placed, that the Piece be neither top-heavy or otherwiſe, whether the Piece be bored away or no.

2. To *Diſpart* his Piece, that is, to ſet ſuch a mark upon the Muzzle Ring or thereabouts, that a ſight line taken upon the top of the Baſe Ring againſt the Touch-hole by the mark ſet at or near the Muzzle may be parallel to the Axis of the Concave Cylinder. To do this, take the Diameters of the baſe Ring, and

the

C. 4.

the place at the Muzzle where you intend the Diſpart to ſtand, divide the Difference of theſe two into two equal parts, and one of them will be the Diſpart, which ſet upon the Gun with Pitch or Wax, or which is the beſt way to frame a Diſpart as you ſee in the *Fig.* (18.) and tie it about the neck of the Gun with Marlyn or Twine: But if you have not Compaſſes, meaſure the Circles about, and work with them.

3. To be knowing in the weights of his Shot, which he may do by knowing the weight of one; as a Bullet of Iron of 4 inches Diameter, is found by Experience to weigh 9 l. Say, as the Cube of 4 is to 9 l. ſo is any other Diameter Cubed to its weight: or as 9 l. is to the Cube of 4, ſo is any other weight to the Cube Root of its Diameter. Lead and Iron are in their weight near, as 2 to 3, that is, a ſhot of 2 l. of Iron, and a ſhot of 3 l. of Lead will have the ſame Diameter or height Iron to Stone is as 3 to 8, Lead to Stone as 4 to 1, that is, a Bullet of Stone of 10 l. is equal in height to a Bullet of Lead of 40 l. Therefore knowing what a Bullet of Iron or any Diameter weighs, you may find the weight of a Bullet of the ſame Diameter of Lead or Stone, by ſaying, for Lead having the weight of 9 l. of Iron for 4 inches: if 3 give 2, what ſhall 9, 6? And for Stone, if 8 give 3, what ſhall 9 l. 3, 37? And ſo of any other: if more exactneſs be required, ſeek for it in the Table of Metals, *Pag.* 17.

4. As the Shot is regulated by the Cubes of the Diameter, ſo is the Powder; ſuppoſe one pound and half of Powder be a charge for a Falcon of 2, 68 Bore or Diameter, what weight of Powder will be fit for a charge of Cannon of 7. Say, as the Cube of 2, 68, to 1, 5 l. of Powder, ſo Cube of 7 to 26.

The

The Logarithms facilitate this work, the Log of 2, 68 is 0.428135x3 = 1.284405 of 1, 176091. of 7 is 0.845098 x 3 = 2535294 -0. 176091 4 2535294 = 2 711385—— 284405 = 1 926980, which is the Log. of 73, which is much above the allowance.

5. To know whether his Piece be true bored the Maſter Gunner muſt ſhew him, for that is only practice, by taking the differences of the Diſparts from a fitted Cylinder of Wood for the Bore.

6. For the ſhooting in great Guns, and the knowledge of the true diſtance that any Piece will carry to, is a matter that depends upon many uncertainties, an exact anſwer will never be given to ſuch queſtions there is ſuch varieties in the truneſs of the Bore, in the height of the Shot, in the levelling and direction, in the Air, Wind, &c. But for all theſe difficulties an able Gunner will go near the mark and he conſiders *Point blank*, or *Right Ranges*, the *Middle Ranges* and *utmoſt Ranges*; the former Table gives you the level Ranges of each Piece, under the Title of Paces point Blank, five feet to a Pace, which is the beſt diſtance for Batteries; the ſame gives you the utmoſt Random accounted near ten times the former level Range; and for all other Mountures while Gunners have agreed, which I ſhall not live to ſee, take this Table to every ſix points of the Gunners Quadrant for theſe Guns, viz. to 45°.

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	1	2	3	4	5	6
annon of 8.	750	1275	1590	1710	1785	1800
annon of 7	675	1147	1431	1489	1606	1620
Dem. Cannon	625	1062	1325	1425	1487	1500
ulv	750	1275	1590	1710	1785	1800
Dem. Culv.	725	1232	1537	1653	1725	1740
aker.	625	1062	1325	425	487	1500
inion.	450	765	954	1026	1071	1080
alcon.	550	550	1166	1254	1309	1320

Fot ſhooting in Mortar-Pieces which are elevated above 45 degrees, and nearer to 90; you muſt uſe much practice to come to be perfect, after a ſhot or two be made you will be beſt able to judge how you muſt order your Gun, keeping ſtill to the ſame Powder, the alteration whereof will alter the ſhots Random, you may have Tables in moſt Books of Gunnery, which you may prove and approve.

§ 6. *Problems* for Practice of *Plain and Spherical Triangles* upon the Sphere in Plano; with the ordinary proportion thereupon; *Problems* In *Geography* and *Navigation*; *Dyalling*, a *New Projection of the Sphere*; *a particular Dyal.*

Prob. 1. Of theſe three, the length of a *Perpendicular ſtyle* upon an Horizontal Plain: 2. The length of the *Shadow*: 3 The Altitude of the ☉ above the Horizon, any two being given to find the third, ſee (*Fig.* 19) Say, as in plain △s, as AC . AB :: Rad. cot. of ABC the upper edge of the ☉ .4 15^{1} the height of the Centre. Turn the Figure upwards, it is the ſame upon a Wall.

Prob. 2. Of theſe Three; 1. The *Meridian Alt.* of the ☾ or ✳; 2. The *Elevation of the Pole*;

Pole; 3. The *Declination of the* ☉ or ✱ any two given, to find the third For Alt. Equinoctial (which is always the Complement of the height of the Pole)——Merid. Alt = Declination South or Merid. Alt. —— Alt. Equi. = Declination N. The greateſt Declination is found now conſtantly to be 23 deg. 30′.

Prob. 3 Of theſe Five; 1. the greateſt Decl. ☉; 2 Longitude of the ☉, from the next Equi. point; 3. the ☉ Right Aſcenſion; 4. The Decl. ☉ in that place; and 5ly, The Angle of the Ecliptick, with the Meredian, any two being given to find the reſt: For in (*Fig.*20.) the △, ♈ ☉ *a* right ∠ at a, ∠ at ♈ is the firſt part in the *Problem*, ♈ ☉ the ſecond; ♈ *a* the third, *a* ☉ the fourth, and the Angle ☉ the fifth, any two being given, the other 3 may be found by the Rules for right Angl'd △s before taught. Note that the Longitude of the ☉ and its right Aſcenſion from the beginning of *Aries* are true in the firſt Quadrant, but muſt be ſubſtracted in the ſecond Quadrant, and added in the third from or to 180 deg. in the fourth Quadrant muſt be ſubſtracted from 360.

Prob. 4. The *Right Aſc.* ☉ the hour of the day, the right Aſcenſion of Mid-heaven, any two being given to find the third, for the right Aſ. ☉ + Time from Noon = right Aſc. of Mid-heaven and Time from Noon = right Aſc of Mid-heaven ——— right Aſc. ☉, and right Aſ. ☉ right Aſc of Mid-heaven ——— Time from Noon.

Prob. 5. Of theſe Six: 1. Elevation of the Pole; 2. Decl. ☉ or ✱; 3. Altitude of the ☉ or ✱; 4. The diſtance of the ☉ or ✱ from the Meridian; 5. The Azimuth of the ☉ or ✱ from the North; 6. The Angle of the ☉ or ✱ ſhewing its Poſition in reſpect of the Pole or Zenith, any three given to find the reſt: For in the Oblique angled △ Z ☉ N. Z N. is the complement of the Elevation, the firſt, N. ☉ the Comple-

C. 4.

mplement of Dec. the ſecond, Z. ☉ the complement of the ☉ Alt. the third: The Angle at N. is the diſtance of the ☉ or ✳ from the Me-d = to the time of the day the fourth, the ngle at ☉ is the fifth, and at Z the ſixth.

Prob. 6. Of theſe Five; 1. The Elev Pole; ☉ Decl. 3. ☉ Alt. at 6; 4 ☉ Azimuth. at , 5. The ☉ Poſition in reſpect of the Pole and enith; any two given to find any one of the ſt, for in the right Angled △ *b* Y *c*. ∠ at Y is e firſt, Y *b* the ſecond, *b*·*c* the third Y *c* the urth, and the ∠ at *b* the fifth

Prob. 7. Of theſe Five. 1. Decl. ☉ 2. Elevation of the Pole; 3. The Amplitude of the ☉ ſing or ſetting; 4. The Angle of the Horizon nd Merid: at the ☉ riſing; 5. The time from idnight, any of theſe two being given to find ny of the reſt: for in the right ∠ W *d* NO, D N is the complement of Declination the firſt, NO the ſecond, *d* O the Complement of the hird, ∠ *d* the fourth, 7 N the fifth.

Note, That the Angle at N or ∠ *d* N *o*, is the ompl. of the Aſcenſ. Diff which might be found lſo more clearly in the △ Y *f* *d*, under the Hor.

Note, That the Aſcenſional Difference turned nto time, by allowing for every degree 4′ of time ſheweth how far the ☉ riſeth from ſix a Clock, may be the time of the ☉ riſ. and ſetting.

Note, That if the Elevation of the Pole, and ☉ Decl. be both either North or both South, then the right Aſc.———Aſc. Diff. = obl. Aſcenſion, and added = oblique Deſcenſion; but if the Elevation of the Pole, and ☉ Dec. be the one North and the other South, then add for the oblique Aſcenſ and ſubſtract for the Deſcenſion.

Note, For the Not-riſing or Not-ſetting of certain Stars. 1. If the Elevation of the North Pole be greater than the Complement of the North Declination, then that Star ſetteth not, or

than

than the South Decl. then the Star riſeth not, an if the Elevation of the South Pole be greater th the Complement of the South Declination of th Star, then that Star ſetteth not, if greater th the North Declin. then that Star riſeth not

Note, That if you double the ☉ ſetting it is th length of the day, ☉ riſing the length of t night, and half of that is the ſemi diurnal Arch

Note, Becauſe the obtaining of the Hour a Azimuth is very uſeful by taking the height o the ☉, I will here ſet down an *Exam.* of the both, after the manner of the laſt *Problem* Spherical △s. In the Lat. 51. 30. the ☉ heig 32° the Decl. 18° firſt for the hour, then th Azimuth.

Hour.

Co. pole 38 30 ar. ſi. 0.205850
Co. Dec. 72 00 ar. ſi. 0.021723
dif X = 33 30
+ Co. Ht + 58 00
= Z = 91 30
= X — 24 30
Half Z 45 45 ſine 9.855069
Half X 12 15 ſine 9.326699
Z. 19.409368
Sine 30° 26′ half Z. 9.704684
The hour 8 a Clock and 1 min.

58
33.30
24.30
22 + 33.30
− 33 30
½

Azimuth.

Co. pole 38 30 az. ſi. 0. 250850
Co. Ht. 58 00 az. ſi 0. 071579
X — 19 30
Co Dec. 72 00
Z — 91 30
X — 52 30
Half Z — 53 45 ſine 9.645706
Half X. — 26 15 ſine 9. 645706
19.778231
50° 47′ half 9.889115
The Az 50° 47′. from the South.

Note,

Note II. Of *Geography*, which is the knowledg
the Habitable World, and the meaſures there-
; firſt, you muſt know that the Latitude of
y Place is the diſtance of it in degrees and
rts from the Equinoctial ; the Longitude is
e diſtance from the firſt Meridian placed by
olemy in the *Canaries*, but the moſt of the
eſt Geogr. place it in the *Azores*. From Weſt
Eaſt the account is by degrees and parts, or
hours, accounting 15 degrees to an hour,
d for every degree four minutes, and every
nute four ſeconds.

The *Zones* are *five*; 1. The *Torrid* Zone be-
ixt the Topicks, two *Temperate* betwixt
her Topick and the Artick and Antartick
rcles, and two *Frigid* from them to both the
les.

The *Climates* and Parallels lie parallel to the
uator. A *Climate* is a *Zone* or Girdle that is
tained betwixt two Circles parallel to the
uator, thoſe Circles have the longeſt days dif-
ing half an hour, the middle Circle betwixt
em has a quarter of an hour difference from
e Extremes.

In reſpect of the ſhadows, the Inhabitants are
ferenced into *Amphiſcii*, whoſe ſhadows are
metimes in a year round about them Eaſt,
eſt, North and South, being thoſe that inhabit
e Torrid Zone. *Heteroſcii* thoſe that have
ir ſhadows one way as in the Temperate
nes. *Periſcii*, thoſe that in a day may have
ir ſhadows round about, as in the Frigid
nes.

In reſpect of the ſituation, the Inhabitants
e *Periœcians* that dwell under the ſame Meri-
an, and in one Parallel diametrally oppoſite
that parallel, they have the ſame Winter and
mmer at contrary times, unleſs in the Frigid
ne; *Antœcians* dwell in like parallel from the

Equator,

Equator, the one North, the other South, and u der the ſame Meridian and Longitude; *Antipode* are thoſe that are Diametracally oppoſite by th Centre of the Earth: they have contrary Winte and Summers, and days and nights contrary, out of the Torrid Zone.

The next thing is to conſider the Maps, fir of the World in General; which have theſe Ci cles, the *Equinoctial*, *Ecliptick*, *Tropicks* *Cancer* and *Capricorn*, *Circles*, *Artick and Anta tick*, *Meridians* and *Parallels*, ſuch a Map ſhew the Effigies of the Globe of Earth *in Pla* and in it you conſider what places are North South, Eaſt or Weſt by the Meridians and Pa rallels, and conſidering any Province or Plac you preſently ſee how it is poſited to the Nor or South by its Latitude, to or from the fi Meridian by its Longitude, then in what Zo or Climate, what is the longeſt day, Latitud Longitude; and it is conſiderable that Ge graphers make the right ſide of a Map the Ea the left Weſt; the North the higheſt, a South the loweſt parts; next for the diſtance Miles, the *Italians* and *We* account ſixty to degree, which would anſwer a mile for a mi nute, but it holds not true in either, for a cording to Mr. *Norwood*, near 70 miles *Engli* make a degree, and in *Italy* at *Bononia* acco ing to *Ricciolus* 66; however let the account 60 to a degree, and then to reduce thoſe to E *gliſh*, ſay, as 6 to 7, ſo is *Engliſh* miles t Aſtro. miles; and contrarily, as, 7, 6, ſo Aſt miles to *Engl.* How meaſures in Feet of m Countries agree, you may find in the Table the end of the Book, Entituled, *Foreign M ſures and Weights compared with the Engli* In all particular Maps you have a ſcale of mil to meaſure the diſtance of places, if thoſe pla lie within the opening of the Compaſſes, if th

th

her, then by a Ruler turn the Compaſſes oftner
bout. The Globe of the Earth hath for its Su-
erficies, Land and Sea, near the one equal to
e other, the great Continents of *Europe*, *Aſia*,
frick and *America*, are called the *Firm Lands*
r *Continents*; the reſt are *Iſlands* rounded by
e Sea; *Peninſula*'s joined only by a neck of
and to the greater, as the *Morea*, &c. *Iſthmus*
at very neck, *Promontory* high ground that
ts out into the Sea.

Again, the Seas are divided Into *Oceans* or
ain Seas, and the *Mediterraneum*. or Midland
ea. A *Gulf* is part of the Sea, almoſt cut off,
s the *Baltick* Sea. A *Streight* is the part cut off,
s the Streights of *Gibralter*, theſe are the Ge-
eral Heads: And for a more particular practice,
onſider *Figure* 21. wherein N. is the North
ole, S. the South Pole, E Q part of the Equi-
octial, A and B two Places in the Northern
Hemiſphere, D, C two in the Southern, A B,
C, add D C are part of great Circles paſſing
etwixt thoſe ſeveral places; Q B the Latitude
f B, E A the Latitude of A, both North, F D
nd C Q the Lat. of D and C South. $\angle$ A N B
$= \angle$ D S C is the Difference of Longitude, of
and B or D and C, the $\angle$s N A B and A B N
hews the poſition, how one place lies from
nother: Therefore firſt. if twoplaces lie in the
ame Meridian, both on the North-ſide of the
quinoctial; as B and F: Q B being the Lat.
f B and Q F of F, the difference of their La-
itudes B F is their diſtance in degrees; if one
ie on the Equinoctial, th'other not, as Q B the
Lat. of B. is the Diſtance, if one have N. Lat.
he other South as B and C, the ſum of both
heir Latitudes is their Diſtance B C. All which,
nd ſome other varieties, as being both upon
he Equinoctial, are eaſily underſtood upon the
Scheme.

And for more Exact Rules to know the Diſtances,and Poſitions of Places, conſider the Triangle ANB, there are ſix parts in this obliqu Spher. △. AN the Complement of the Latitud of A,NB the Complement of the Lat. of B, A the Diſtance of A and B in a great Circle, ∠AN B the Diference of Longitude of A and B, the ∠NAB the poſition how B bears from A, fro the Merid. towards the Eaſt, and the ∠NB how A bears from B towards the Weſt, An three parts of theſe ſix being given, to find an of the reſt, uſe the Doctrine taught before oblique Spher. △s if both the places be in South Lat. as BC it is the ſame with the former, one be North the other South reſolve the △ NAC. Theſe Rules ſerve to find the diſtanc and poſition of any two Stars after the ſam manner. The △ CAB may by help of the former Rules be likewiſe reſolv'd.

Laſtly, To know how many ſquare miles perches there are in the whole Earth, or in an parcel or part thereof included in a Triangl as ANB for the former, find how many ſqua degrees there are on a Sphere, whoſe circum ference of its greateſt Circle is 360; ſay, by the Rules before taught; As 7. 22 : : ſo ſquare 360 (= 129600) to the ſuperficies of the whol Sphere in ſquare degrees 407314, and ſuppo ſing ſixty miles in a degree, there will be 360 ſquare miles in a ſquare degree (though the be more in the Curve) which gives 14663304 ſquare miles in the whole; but to reduce theſ to *Engliſh* miles: ſay, Q.6 = 36 Q.7 = 49: ſo 1466330400 to 1077303266 *Engliſh* mil by the Back Rule.

But if it be a Spherical Triangle, as AN or any other, as ABC, and it be required give the proportion of that △ to the whol Sphere,according to Mr. *John Leak*'s Rule, de monſtrat

C·4·

nſtrated by Mr. *Foſter*, add all the Angles of
Spherical Triangle together, from which
duct 180 deg. divide the reſt by 720, it leaves
deg. and min. in Proportion to 360, as that
iangle to the Sphere.

ote III. Of Navigation, which teacheth how
by what means a Ship may be directed on
Sea to the Place or deſired Port.
n ſhort Paſſages, where you are but a ſmall
e without ſight of Land, the Compaſs and
owledge of the Land and Sea-marks are ſuf-
ent; but in long Paſſages, where, beſides
Compaſs, Lead and Log line, there are re-
red Inſtruments to take the Latitudes, and to
uire after the Longitude and Diſtances. You
y conſider the ſame as one ſimple Courſe, or
pounded of many: There are three ways
performing both Courſes; 1. By the *Plain*
chart; 2. By *Mercator's Chart*, or laſtly, by
reat Circle. The laſt is in part taught by the
e in *Geography* laſt mentioned, of the di-
ce and poſition of Places, but is not practi-
le at Sea The firſt may ſerve near the
inoctial, but farther off and in long Courſes
alſe; the ſecond is true in all Courſes, and
ht to be moſt practiſed; the firſt and ſecond
s are practiſed alike in plain Triangles, the
erence only, that the *Meridians* are not
lly divided in *Mercator*'s way; but you muſt
the Table at the latter end of the Book,
d, *A Table of Meridional Miles*, whereas in
n Sailing all the Lines are equally divided:
Practice will beſt appear by theſe few *Pro-*
s.

obl. I. To convert the *Rumbs* or Points of
Compaſs into Degrees of Inclination to-
ds the Meridian Line and contrarily. The
ners divide their Compaſs (which repre-

ſenteth the Horizontal Circle) into 32 pa called Rumbs; but it had been far better to hav uſed 360 degrees, to have been accounted fro both ends of the Meridian Line towards Eaſt an Weſt: But becauſe this Diviſion is not uſed, ta this Table, which will convert the Points of th Compaſs into degrees and minutes of the I Inclination with the Meridian, and contrarily.

These on this ſide of the Weſt encline towards the North-end of the Meridian.	*Angle of Inclinat with the Mer. L.*	*These on this ſide the Eaſt incline towards the North of the Meridian.*
Rumbs.	North.	Rumbs.
North by Weſt.	11° 15'	North by Eaſt.
N. N. W.	22 30	N. N. E.
N. W by N.	33 45	N. E. by N.
North Weſt.	45 00	North Eaſt.
N. W. by W.	56 15	N E. by E.
W. N. W.	67 30	E N. E.
W. by N.	78 45	E. by N.
Weſt.	90 00	Eaſt.
Weſt by South.	78 45	Eaſt by South.
W. S. W.	67 30	E. S. E.
S. W. by W.	56 15	S E by E.
South Weſt.	45 00	South Eaſt.
S. W. by S.	33 45	S. E by S.
S. S. W.	22 30	S. S E.
S. and by W.	11 15	S. by E.
Rumbs.	South.	Rumbs
These on this ſide W. incline to the S. end of the Meridian.		*These on this ſi incline to the S of the Meridian*

If you account to quarter of Points, add c. 4. 2° 48′ for one quarter, 5° 37′ for two quarters, and 8° 26′ for three quarters.

Prob. II. A Ship ſailing under a great Circle, o know how many Engliſh miles anſwers the egrees: If it ſail directly N. and S. it is under he Meridian, if E. and W. under the Equinoctial; ſay, As 1 degree gives 70 miles :: So degrees gone give the Engliſh mile.

Prob. III A Ship ſailing under any Parallel, o know how many Engliſh miles anſwer to the umber of degrees in that Parallel; ſay, As Rad. i. co. to the Lat. or the Parallel :: So is the umber of the degrees in that Parallel, to the umber of Great Circle degrees; which turned nto miles, gives the Anſwer.

Prob. IV. The *Rumb*, the *Diſtance* upon the *umb* in miles, (60 to a degree,) the *Difference of atitude* in miles, the *Difference of Longitude* miles, any two of theſe given, to find the other wo: In a plain right ∠d △. (ſee *Fig.* 22.) where is the place from whence the Ship ſails, the umb N E. by N. therefore the Angle of Inclination BAC by the Table is 33° 45′, its Complement BCA 56° 15′, C the place to which the hip is to ſail, AC the diſtance in miles 909 iles, AB is the difference in Longitude 853 miles, is in Latitude 59° 36′ = A.C in Latitude 47°, erefore A C is 856 miles; this is according to e plain Sea-Chart: But according to *Mercator's*, u muſt find the diſtance A C by the Table of eridional miles, thus; Uſe the ſame directions ven in the Note for *Geography*, the places being th on one ſide of the Equinoctial, ſubſtract the erid. miles anſwering 47°, *viz.* 3202 from e Merid. miles anſwering 59° 36′, *viz.* 4480, ſt 1278 miles for the diſtance A C. This ing the only difference in theſe two kinds of iling, and thus obſerved, the Reſolution of this

△ will perform all ſimple Courſes; and if it be compounded of many Courſes, you muſt ſo many times multiply your Operation.

Note IV. Concerning *Dialling*. To make an Horizontal Dial, you muſt calculate the diſtances on the Horizon to the Meridian, to each hour, half hour, and quarter by this Rule; As Rad. to Sine of the Latitude :: So Tang of the Equinoctial hour from Noon, to the Tangent of the Horizontal Diſtance from the Meridian, of that hour, half, or quarter.

If you deſire to calculate for every minute, then you take every minute for the Equi. hour, if for every quarter, then begin with 3° 45, 7° 30, 11° 15, and 15 for an hour, *&c.* To make a Dial for a full South Wall, is the ſame with the former, only changing the Sine of the Latitude to the Coſine.

For a declining upright Plane, you muſt firſt find the Angle of the *Meridian* and *Subſtyle* thus, as Rad. to Cotang. Lat :: Sine Decl. to Tang. desired Secondly, the height of the Style above the Subſtyle, thus, As Rad to Coſi Decl. :: Coſi. Lat. to the Sine of the height deſired. Thirdly the difference between the Merid. of the Plane and Place, As Si. Lat. to Rad. :: So Tan. Decl. to Tang deſired. Fourthly and laſtly, you muſt find the Angles which the Hour lines make with the Subſtyle line, which is the Merid. of the Plane; As Rad. to Si. of the Style height above the Plane: So is the Tang of the Hour line from the Merid. of the Plane, to the Tang deſired. For a Meridian Dial, where the Plane looks full Eaſt or Weſt, the Hour lines are all parallel to the Line that paſſeth from Pole to Pole, which is the hour of 6, then ſay, As Rad to the height of the Style in any known parts of a Scale :: So is the Tangent of any hours diſtance from 6, to the diſtance thereof in the ſame parts.

N

Now for a Mecanical way to make any Dial C. 4.
o any Plane, whether declining, reclining or
nclining, crooked, bended, or any ways uneven,
without any notice taking of any ſuch declina-
tion, reclination, &c. by the help of a large and
good Horizontal Dial which muſt have a ſmall
hole in the Centre to ſuffer a ſilk Thread or Hair
o go through; you may work thus under the
Plane: Where you intend to make a Dial, draw
Level Horizontal Line by a Carpenter's or
ther Level, to this Line ſet a Scaffold or Frame
f any board or boards deep according to the
bigneſs you intend the Dial to be; this Scaffold
uſt be level likewiſe.

This being fitted, and by any other true Dial,
quinoctial Ring, or by the height of the ☉, your
Minute-Watch rectified, or other way, find the
rue Time of the Day, and placing your Horizon-
al Dyal upon the level Plane, keeping it to the
rue time of the day, by removing it to and fro,
ou may by the thread from the Centre, carried
y the edge of the Gnomon, find out the Centre
the new Dial, if it will have a Centre, which
ark, and by ſmall tacks faſten your Horizontal
yal in that place, that it may not move the
read or hair carried by the edge of the Gno-
on, it continued in either Pole, and is the Gno-
on to the new Dyal; the perpendicular Line
der it taken by a ſquare is the Subſtyler, and
e Style may be faſtened to the Plain by help
that thread.

Now to draw the Hour lines, do this; Lay the
read, fixed to the Centre of the Horizontal Dial,
er the Hour lines and Quarters, and mark out
the Horizontal Line on the plain where they
erſect; Lines drawn from the Centre of the
w Dial to theſe Points, are the Hour lines:
t ſome Hour lines may run off the Plain, or
reaſon of the crookedneſs, or ſome Pillars

may hinder; to help this, draw as large a ſquare or oblong upon the Horizontal Plain as you may, and transfer (by help of the Centre thread) all the hours from the Horizontal Dial into the Lines o the outſide of the ſaid ſquare or oblong; now i you bring a thread from the Centre of the new Dial, and reſt it upon the hour Points marked i the ſaid ſquare, the Centre thread of the Horizontal Dial carried only to touch the other thread, will deſcribe the Hour line deſired, whether upon an even or uneven Plain that have Centres for the new Dial; but if the Line carried by the edge of the Gnomon of the Horizontal Dial will not meet with the Plain, as in all Eaſt and We Plains much declining, then muſt you fix up a board or other matter to receive the Centre b the ſide of the Plain, and then fixing a threa there, by that and the other thread you may ſtrike all the Hour lines, as was before ſhewe in crooked Plains, and the thread from the Centres being the new Gnomon, muſt be fixed t the Wall by two ſtays

This may be practiſed with as much curioſity as any other, and will be ſure and exact.

Note V. The *Deſcription* and *Uſe* of an *Univerſal Dial* for all Latitudes, being a Projectio of the Sphere in *Plano*, preſented to his Roya Highneſs, *Anno* 1665. for his particular Uſe a Sea.

One *Hemiſphere* being circumſcribed by a Cylinder, wherein the Equinoctial and Cylinde touch, let the Hemiſphere be conceived ſo t extend from the Equinoctial, that the two Colures, and all the Meridians, may touch the Cylinder in the Tangents of the Degrees and Minutes of the Meridians, all the Meridians wi be ſtreight Lines, all the Parallels Circles diſta from one another as their Tangents; and f particular uſes, let the Hemiſphere have upon th

Interſecti

c. 4

nterſection of the Equinoctial Colure and Equi-octial Semicircles, at each degree diſtance.

Theſe, as likewiſe the Ecliptick, and all other Circles deſcribed from that Point, will be Ellipſes n the Cylinder: Having this Cylinder thus fur-iſhed, laying it upon a Plain, ſo that the Equi-octial Colure may touch the Plain, let this Cy-inder be orthographically or perpendicularly rojected on that Plain; ſo have you the Dial or Hemiſphere now before you, the demonſtration whereof will be too tedious for this place. The eſcription thus: The Point of ♈ and ♎ is the Centre, the uppermoſt Line divided both ways in-o 90 degrees is the Equinoctial, the Line ♈ o that oes at right Angles down is the ſemicircle of the Equinoctial Colure, the two edges are the Sol-ſtitial Colures, and ſtand for the Meridian of 12 Clock, all the ſtreight Lines from top to bot-om are the Meridians or Hour lines to every uarter of an hour, 15° of the Equinoctial above eing an hour; the Meridians on both edges are umber'd, from the Equinoctial to the Pole, and rom the Pole to the Equinoctial to 90°. The arallels to the Equinox are drawn through very degree of the Meridian, and are ſo num-red both on the edges and on the middle, being he Axis of the Sphere, upon the Quadrant on the ft hand are drawn ſeveral Elliptical lines, which epreſent the Circles formerly ſpoken of, deſcrib'd pon the Centre, being the point of Eaſt and Weſt to every two degrees. The Ecliptick is rawn both ways from the Centre ♈ and ♎, eclining 23 degrees 30 minutes upon the Meri-ian, and divided into Signs and Degrees by hoſe Elliptick Lines.

The back ſide of the Inſtrument has many Uſes ſhewed in the beginning of the Book; hoſe of this Projection follow.

Uſe 1. Having the ⊙ place, to find his Declination, Right Aſcenſion, or by either of theſe to find the place. Firſt, find by the day of the Month on the back ſide the ⊙ place, which ſeek in the Ecliptick, the Paralel that paſſeth by that place ſhews the ⊙ Declination, and the Meridian the ⊙ Right Aſcenſion in the Equinoctial; ſo likewiſe the Declination or Right Aſcenſion given, ſhews the ⊙ place.

Uſe 2. To rectifie the Centre Thread to ſhew any Horizon, or any Line of Eaſt and Weſt which paſſeth to the Zenith, or any Inclination to the Horizon or Equinoctial, that any point upon the Hemiſphere ſhall make with the Horizon. The Centre thread laid to the Latitude of the place on the left hand in Summer, or on the right hand in Winter, will repreſent the Horizon of that Latitude by the greater figures which come numbred from the Pole. And if you lay it to the Latitude from the Equinoctial numbred by the ſmaller figures on the right hand in Summer, or left hand in Winter, it repreſents the Line of Eaſt or Weſt, and the point in the Meridian ſhew the Zenith. Or any point upon the face being ſet out by the parallel and time of the day, laying the Centre thread thereto, it ſhews on the edge how many Degrees it inclines or declines to or from the Equinoctial, and that being added in all Northern Signs, or ſubſtracted in Southern to or from the Equinoctial height (which is always = to the Complement of the Latitude,) it gives the Inclination or Angle a great Circle paſſing by the point given makes with the Horizon.

Uſe 3. To know the time of Riſing and Setting of the , the Aſcenſional Difference, the Amplitude, and the length of the Day or Night.

By

y the laſt Propoſition lay the Centre thread to c. 4.
e Meridian for an Horizon, wherever the ☉
rallel cuts it, amongſt the Hour lines, it gives
e ☉ riſing and ſetting, and the Elliptical line
hich paſſeth by that place gives the Amplitude,
the diſtance in degrees from the Eaſt; the
eridian of the ☉ riſing carried to the Equino-
alſhews the Aſcenſional Difference in degrees;
tly, double the ☉ ſetting for the length of
e days, and riſing for night.

Uſe 4. To find what time the ☉ will come
ſt or Weſt, and what height the ☉ ſhall have
that time. By the ſecond Propoſition, lay the
Thread to the Latitude told from the Equino-
al in the edge on the contrary ſide to the Ho-
on that is the Line of Eaſt and Weſt, and fol-
ng the ☉ parallel to that Line, the Point
here the Interſection ſhall be amongſt the
urs gives the time, and among the Ellipſes
e ☉ height at that time

Uſe 5. To know the height of the ☉ at ſix
lock, and the Azimuth or diſtance the ☉ ſhall
ve from Eaſt to Weſt. Follow the ☉ parallel
ix a clock, the crooked lines ſhew you the
height; and laying the Centre Thread to the
int of Eaſt or Weſt, mark where the Parallel
s it, and follow the Hour line to the Equi-
ctial. (which now ſhall repreſent the Hori-
n) the diſtance from the Centre is the Azi-
th.

Uſe 6 To find the ☉ height at any time
the day Setting the Horizon right, find the
int of the ☉ riſing, then ſetting one point of
Compaſſes there, extend the other to the Ze-
h, and by a black lead Point make an Arch
t ſhall end upon the hour of the ☉ riſing.

the degrees of that Circle cut by the Hour-lines, ſhew the ☉ height.

Uſe 7. To rectifie the Hook, Bead and Plummet. At the end of the Hook (which by its skrew may be moved at liberty) there hangs a Thread and Plummet with a moveable Bead, the very end of the Hook, from whence the Plummet hangs, muſt be ſkrewed faſt to the place where the ☉ riſeth on the Horizon, and the Bead muſt be ſet to the Zenith on the contrary ſide.

Uſe 8. To find the hour of the day at any time, the ☉ ſhining. After the Hook and Bead be rectified, as is ſet down in the laſt uſe, lift up the Inſtrument, (ſo that the Bead and Plummet do freely play) that the ☉ may ſhine through the leaſt ſight upon the other, the Bead ſhews the time of the day amongſt the Hour-lines.

Uſe 9. By the ☉ height or hour, to know the ☉ Azimuth. By the ſecond Uſe, obſerve where the Meridian of the ☉ Hour and the Parallel meet, and thereby on the ſide find the Inclination of the Point to the Horizon, where lay the thread; then by the 6th Uſe, find the ☉ height; now let the Equinoctial repreſent the Horizon, and accounting the height amongſt the Parallels where Parallel croſſeth the thread laid to the Inclination, follow the Meridian to the Equinoctial, the number from the Centre is the Azimuth from the Eaſt.

Uſe 10 All the former Propoſitions may be applied to the Stars, remembring the ☉ ſhews the hour; therefore uſe the Right Aſcenſion of the ☉, which take from the Right Aſcenſion of

c. 4.

he Star,(if it be bigger,if not, add 24 hours)reſts he time of that Star's coming to the Meridian; nd if you know the Stars hour before midnight, ake it from the time of the Stars Southing; if fter, add it, you ſhall have the true time of the ight. Theſe excellent Uſes you have from this nſtrument,ſold, if you deſire it, with the Book: f you deſire it of Metal,and larger, Mr. *Hayes* Mathematical-Inſtrumentmaker, living in *Moorelds*, will make them. Laſtly, upon the inde of the Cover you have a perpendicular Dial will ſerve within 30 miles from *London* preſently o know the hour of the day, the Parallels up nd down anſwer the day of the Month, the ther ſtreight lines that are parallel ſhew the ☉ height,and wherever that croſſeth the other, here is the hour, the long hours for Summer, nd ſhort ones for Winter,and placing a Pin in he Point *VI*,letting it ſhade in the Line *VI, IV*, Line and Plummet playing from it, will ſhew he ☉ height on the right ſide.

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§. 7. *Of the Nature and Making of* Watches, Clocks, *and other* Movements, *Collected from Mr.* Oughtred's Automata; *with ſeveral Additions and Notes about* Pendulums.

Train

THE great Wheel, whereon the Fuſie or String with Weights are fixed, divides the Nature of the Work in any *Movements*, that is, all the Wheels and Pinions from that to the Ballance or Fly only prepares the Motion, but the other way effect it. Things to be noted, are.

1. The Fuſie, and how many Turns it hath:
2. The number and names of the Wheels, Teeth,

Teeth, and Pinions, *viz.* in a Watch of four Wheels, (ſuppoſing the Numbers annexed to be the Teeth;) Firſt, The *Great Wheel* (Number 55 Teeth) turning the *Pinion*, (number 5) fixt to the *Second Wheel*, (Number 45.) turning the *Pinion*, (Number 5.) fixt to the *Contrat Wheel* (Number 40) turning the *Pinion*, (Number 5,) fixt to the *Crown Wheel*, (Number 17.) having odd Teeth, working upon the *Pallats* of the Ballance, (Number 2.) But in Watches of five Wheels, there will be a third Wheel before the *Contrat Wheel*.

3 The *Pinion* of *Report* fixt to the Arbor of the *Great Wheel*, (Number 4) which lies hid betwixt the Plates in Watches, and turns the Hour wheel (Number 36) which carries the Hand about upon the Face, divided into 12 or 24 hours.

For brevity ſake, let *M* ſtand for the *Movement*, whether Watch or Clock, *F* the *Fuſee*, *A* the Great Wheel, *a* the Pinion of Report on its Arbor, *E* the ſecond Wheel, *e* the Pinion on its Axis, *I* the Contrat Wheel, *i* the Pinion on its Axis, O the Crown Wheel carrying *o* its Pinion on its Axis; *B* the Dial wheel carrying the Hand, in *H.* Hours, *T.* Time, *t.* turns, *N.* Notches or Beats of the Ballance; *Con.* Continuance and length in Time of the Watches going.

The work will ſtand, both in Letters and Figures, as in the Example.

a) B (*d* 4) 36 (9

---

e) *A* (*f* 5.) 55 (11
i) E (*g* 5.) 45 (9
o, *I* (*k* 5,) 40 (8
o 17 Crown Wheel.
2 Pallats.

Where

where every wheel is divided by the Pinion it moves from A to O. *viz.* 55 by 5 = 11 = *f*. 45 by = 11 = 9. = 40 by 5 = 8 = *k*. But *B* divided by *a* gives 9 that is *B* by *a* = *d*.

c. 4.

1.*Rule*.fgkO2 = 11 x 9 x 8 x 17 x 2 = 26928 equal to N. Notches or Beats made in one turn of the great Wheel, and 26928 x 9 = 242352 the beats that are made in one turn of the hand, whether 12 or 24. Laſtly, divide 242352 by 12 it gives the beats in an hour, 20196, and by 60 gives the Beats in a minute, 336, 6. Thus far I queſtion not, is very plain, and muſt be practiſed to be well underſtood, as being the foundation of the whole work; and by it you may eaſily know how many turns any Wheel or Pinion, makes for one turn of the Fuſie or Hour wheel.

2.*Rule*.As the Beats for one turn of the great Wheel or Fuſie——— 26928

. Is to the Beats gone in one hour ——20196

:: So continuance of the Watches going — 16

. To the number of the turns about the Fuſie—— 12

:: And ſo are the hours of the Face ———12

. To the Quotient of the hour Wheel divided by *a*——— 9

Theſe proportions holding, that any three given, (not the ſame kind,) you may find the fourth :: As for *Example*,

To know the continuance of the Watches going, that hath 12 turns in the Fuſie, and 26928 Beats in one turn; and 20196 Beats in an hour. Say, N in an H. N one t F :. 12 t. of F. to Con. 20196) 26928 x 12 (16. But if it be demanded by the Beats, and the time of the Watches going to know the Turns of F 26928) 20196 x 16 (12. Or if it be demanded, what Quotient ſhall be laid

upon

upon the Pinion of Report ; Say, 16. 12 :: 12. 9 ; or as 26928.20196. Note that the leſſer B is taken,the longer ſhall be the continuance of the Watches going at an equal T.

Rule 3. Concerning *Pendulums.* The ſpring in a Watch, drawing harder at the firſt than at the laſt ; and likewiſe in Clocks with weights and ſtrings, there is added the weight of the ſtring gotten every moment, to the Clock weight,and for that no Motion can by hand be made ſo fit, but there will come ſome unequalneſs, as you may hear by the Beats either of Watch or Clock,to juſten and regulate theſe inequalities *Monſieur Hugens* invented the way of applying *Pendulums* to either, for which his Name will be ever Remembred.

Pendulums,whoſe Vibrations are of the ſame Degrees and Minutes are equal, or if they riſe not above a Degree, and the ſquares of their Vibrations are in proportion to the lengths : For a Standard or Rule Monſieur *Hugens* gives the length of a *Penaulum* that ſhall ſwing ſeconds, to be 881 to the *Pariſian* feet 864. The *Engliſh* Feet to the *Paris* Feet by my Table are, As 1000. 1068. Therefore,864. 881 :: 1. 058. 1.08 and 1 .089 x 3 = 3, 267 equal to three feet three inches, and two tenths of an inch.

The Honourable Lord *Brunker*,and Mr. *Hoo* found the length to be thirty nine inches and parts, which a little exceeds the other,and ma be,was Juſtned by Maſter *Hugen*'s Rule for th Centre of Oſcillation ; for *Montous Pendulu* that ſhall vibrate one hundred thirty two time in a minute.it will be found likewiſe 8, 1 inche agreeing to 39,2 inches *Engliſh* : Therefore fo certain 39,2 inches may be called the universa meaſure, and relied on, to be the near length a *Pendulum* that ſhall ſwing ſeconds each v bration. With this caution and Rule, As th

leng

length of the ſtring from the point of ſuſpenſion to the Centre of a round Ball, is to Radius :: ſo is Radius to a fourth number. Let two fifths of that fourth be added to the former length, for the length of the *Pendulum*. Having this Standard, the next Rule is this: That the lengths of two ***Pendulums*** are in proportion to the ſquares of their ſeveral vibrations, which will be equal to the Beats of the Ballance; therefore the Beats that ſhall be propoſed in a minute, being given to be 50, and it be demanded to give the length of a *Pendulum*; Say, as the ſquare of 50 (2500) is to the ſquare of 60 (3600) :: ſo is 39,2 to 56,4 the length required for (2500) 3600 x 39,2 (56,1.) And if the lengths be given to know the ſwings or beats in a minute, As Altitude given, To Altitute known :: ſo ſquare vibr. known. To ſquare vibr. req. whoſe ſquare Root is the Anſwer: And becauſe the two middle terms ſtand in all ſuch Queſtions, and will be always 141120: Therefore divide 141120 by the ſquare of the ſwings in a minute, it gives the length ſought; or by the length it gives the ſquare of the Swings. And thus as the Ingenious Maſter *Hook* firſt propoſed, I have hang'd a ſwing by my Clock to regulate it upon a Pin, that it may freely vibrate.

48) — 4 (12
56 — 7 (8
54 — 6 (9
21

The numbers of the great Wheel 56, its Pinion 4, turning the hour Wheel 48. The great Wheel turns a Pinion of 7 fixt to the Crown Wheel 54, which turns a Pinion of 6 fixt to the Ballance Wheel 21. The Quotients 8 x 9 x 21 x 2 = 3024 the beats in an hour, becauſe the great Wheel turns once in an hour, elſe 12 x 9 x 21 x 21 x 2 = 36288.12) 36288 (3024 and 60) 3024 (50,4 beats in a minute, and as was ſhewed before, the length of the *Pendulum* will be 55, 5 inches, fix a weight upon a Wire running into a Rod, that ſhall have four feet 7, 5 inches below the Pin whereon it plays, and about a foot or above, a Wire beaten flat with ſeveral holes to fit to the top of this Rod, and to a Pin placed upon the Ballance towards the back ſide, will regulate the Motion exceedingly well, and may be done without trouble or charge.

For the regulating the inequality of a ſwing, when it may riſe ſometimes higher, ſometimes lower: There are two ways, either by making the Line play betwixt two Cheek parts of a Cycloid, as Monſieur *Hugens* has directed, which may eaſily be effected to any length of the *Pendulum*, and are made, if any deſire them by Mr. *Humphery Adamſon* (near *Turnſtile* in *Holbourn*) Or elſe by not ſuffering the *Pendulum* to vibrate above an inch from its ſettlement. For my part, after ſome time and charge of Experiments, I believe the firſt the better way. Monſieur *Hugens* in his Book of *Pendulum* Clocks, propoſeth a Watch about a Mans height, to go 30 hours, and to have theſe numbers

D B
6 — 72
a 30 30 a

A 80-8 — (10
E 48·8 — (6
I 48 — 24 (2
O 15

The great Wheel 80, *&c.* which turns about in an hour, and ſhews minutes; therefore for an hour multiply the Quotients, 10 x 6 x 2 x 15 x 2 = 3600 being the ſeconds in an hour (60 x 60 = 3600) or beats. Now the third Wheel I turns about in one minute for 10 x 6 = 60, and carries a plate divided into 60 ſeconds, and ſhews the ſeconds; and upon the Arbor of the great Wheel is fixed a heel *a* turning another wheel *a*, both of 30 C. 4. eeth, both turning about in an hour; the er has on it a Pinion *h* of 6 Teeth turning B in 12 hours. This Watch has a pully tied its weight, by which you may pull it up and t ſtop the Watch; the *Pendulum* plays betwixt o Cheeks, part of a Cycloid.

The next queſtion (ſuppoſing there be a ſcrew low or above the *Pendul.* to lift it up or let it wn upon a ſqu. Braſs Ruler divided into inc. d tenth parts) to know how many minutes d ſeconds every tenth part of an inch will ake the Watch go faſter or ſlower in a day. ake the *Pendulum* which ſwings ſeconds ngth 39.2. Then by the Log. I make this able.

I.	II.	III.	IV.	V.
38. 7	1. 587711	1. 780988	60;39	9 21
38. 6	1. 588832	1. 780378	60;31	7. 26
38. 9	1. 589949	1. 779819	60;23	5. 31
39. 0	1. 591065	1. 779261	60;15	3 36
39. 1	1. 592177	1. 778705	60; 8	1. 55
39. 2	1. 593286	. 778151	60.	[illegible]
39. 3	1. 594393	1. 777597	59 92	1. 55
39. 4	1. 595496	1. 777046	59. 85	. . 36
39. 5	1. 596597	1. 776495	59. 77	5 31
39. 6	1. 597695	1. 775996	59. 70	7. 26
39. 7	1. 598791	1. 775399	59. 62	9. 20

he firſt Column has in the middle the gth of the *Pendulum* 39. 2 inches, upwards diminiſheth one tenth, and downwards in aſeth one tenth.

The ſecond Column are the Log. of the firſt.

The third Column are half of the Log of the ference of the *II* taken out of the Log 5. 588, which is of the ſtanding number 120 aforeſaid: The *IV* Col. are the numbers

bers of the *III* and the *V* Column are the mi nutes and ſeconds that theſe augmentings o diminiſhings will cauſe in a day, and are gotte by Multiplying 24 x 80 = 1440 the minutes i a day, by the decimals above or under 60 which work may be done eaſily to any leng of a *Pendulum.*

Rule 4. Of finding out fit Numbers for th Wheels and Pinions

1. Any two Fractions, whoſe Terms are pro portional perform the ſame Motion ;

9. 36. 45. 63.
——— ——— *&c.* The upper for the Whee
1. 4. 5. 7.

the lower for the Pinion.

2. If it be as one Wheel to one Pinion: ſo is the product of many Wheels, to the pr duct of many Pinions, both will perform th ſame Motion. ***Exam.*** $\frac{1440}{28}$ equal to $\frac{36}{28}$

$\times \frac{5}{1}$ or $\frac{36}{4} \times \frac{8}{7} \times \frac{50}{10}$ for $\frac{36 \times 8 \times 50 =}{4 \times 7 \times 10 =}$

$\frac{14400}{280} = \frac{1440}{28}$ nor matters it in what order th Wheels and Pinions are ſet, or which Pinio ſtand under every Wheel.

3. Theſe Factor's 36 x 8 given, may thus be va ried, *viz* Divide them by ſuch numbers as w meaſure them, and multiply the Quotients the Altern Diviſors, the Product of thoſe two laſt numbers ſhall be two to the product of the Factor's given, for 36 x 8 = 32 x 9 = 288.

9
36.
4
32.

4. If fit numbers cannot be had by any of the three former ways, you muſt ſe ſome Ratio as near as poſſible in this manner,

or

of the two Numbers is to the other :: ſo is
o to 2 4 *h*. Divide that 4*th* number, and
o 360, by 4, 5, 6, 7, 8, 9, 10, 12, 15 ; or
hich of them bringeth a Quotient neareſt to
Integer ; as if the two Numbers be 147, 170
hich are too great to be cut into Wheels, and
cannot be reduced into leſs, becauſe they
ve no greater common meaſure than Unity.
y therefore,

o. 147 :: 360. 3114 6)311(52- 8) 311(39.
7. 170 :: 360. 4164 6)360(60 8) 360(45.
) 360(45- | wherefore for the two Num-
) 416(52 | bers 147 and 170, you may take
and 60 ; 39 and 45, or 45 and 52.

Rule 5. The Diameter or Circumference of
y Wheel being given in inches and one hun-
d parts, and the number of Teeth it is divided
o, to give the Diameter or Circumference of
leſſer Wheel or Pinion, with a number of
eth given that ſhall exactly agree with the
eth of the greater Wheel : *Exam.* The great
heel has one inch Diameter, and fifty Teeth,
leſſer Wheel or Pinion ten Teeth ; ſay if 7.
:: 1. 3, 14 ; then if 50. 3. 14 :: 10. 63 for
Circumference of the Pinion, whoſe Dia-
ter will be ,2 of an inch.

Rule 6. To give numbers to a Watch that
ll have a ſwift train, about 20000 beats in
hour, that may have turns about the Fuſie,
d go 16 hours, and the number of the Crown
heel 17. Say by the ſecond *Rule* 12. 16 ::
00. 26666. the Beats for one turn of the
ſie ; and becauſe by the firſt *Rule* 26666 is
ual to all the Quotients multiplied together
o 17 and into 2, that number being halv'd
13333, and that again divided by 17 gives
the Quotient 784, which being broken into
ee numbers, that multiplied together will
be

be 794, or near to it; let them be 11, 9,
multiplied are 792. Then 792 x 17 x 2
26928; and ſay, 16. 12 :: 26928 10196 th
Beats in an hour. Alſo 16. 12 :: 12. 9 an
$\frac{2}{1} = \frac{36}{4}$. Laſtly, by the three Quotients, aſſum
11. 9 8 find out the 3 Wheels an
Pinions, by taking the Pinions
you deſire, as is done in the ſide
You may try ſeveral Experimen
to make the Watch go longer b
altering the Beats and Pinion o
Report.

4) 36 (9
5) 55 (11
5) 45 (2
5) 40 (8
17
2

Examp. Of a Clock or Watch propoſed t
go a week or 8 days with this Order, that th
Ballance Wheel, or that which moves the *Pe*
dulum may go about in a minute, with a
Index to ſhew ſeconds, that the great Whe
may go about in 12 hours, and that the Whe
next it may go about in one hour to ſhe
minutes: Firſt, how many ſeconds there a
in 12 hours, and that 12 x 60 x 60 = 43
theſe are the Beats that ſhall be in one turn o
the Great Wheel. Theſe are double, becau
there are two ſwings to one Tooth of the Bal
lance Wheel, the half 43200 is 21600 no
the Ballance Wheel muſt needs be 30, divi
21600 by it the Quotient is 720 to be brok
into three Quotients, whereof the firſt mu
needs be 1: for the Teeth of the great Whe
divide 720 by it, the Quotient is
60 for the two Quotients remaining, which may be either 10 and
6, or 5 and 12, or 8 and $7\frac{1}{2}$,
which laſt let ſtand, then the
work will ſtand thus, and the
Pinions taken as you pleaſe to be
all 8. the Wheels muſt be 96. 64.
60. So then the great Wheel will

8) 96. (
8) 64 (
8) 60 (
30
10-14
8-128
8-120
72

C·4

about in 12 hours, the ſecond Wheel in an ur, and the Ballance Wheel in a minute, as ed. I gave my Watch theſe Numbers to above a year.

n my large Sphere going by clock work, re is a motion for the Revolution of the ☉ ogeum writ down on the Circle to be made 17096 years, but by Examining the Work, I d it to be 17100, that is four years more. the Great Wheel fixed is 96, a ſpindle heel of 12 bars turns round it 8 times in 24 urs, that is in 3 hours; after theſe, there are r Wheels, 20, 73, 24, and 75, wrought by dle's ſcrews that are in value but one; there- e 3 x 20 x 73 x 24 x 75 = 7884000 hours, ich divided by 24 gives 328500 days equal o years. Now on the laſt Wheel 75 is a Pi- n of 6 turning a great Wheel that carries Apogeum number 114, and 114 by 6 gives , and 900 x 19 = 17100.

Rule 7. *Of giving particular Motions* to any vement. The number of a Motion, is the oportion that it bears to one turn of the hour heel, or the Pinion of Report, from whither- ver it be taken, which proportion, being oken into two or three Quotients, will ſhew Wheels and Pinions, as if you took it for Beats of the Ballance.

The laſt Note ſhall be concerning *Time*; that ich is ordinarily termed the *Hour of the Day*: nſider this in the length of days, which are o, diſtinguiſhed only by the Revolution of Earth: The firſt is the *Syderial* Day, ere any fixt point or points of the Earth in ſame Meridian or Azimuth returns from Star to the ſame again; the ſecond the *ar Day*, where the ſame Meridian of the th returns from the ☉ to the ſame again, neither

neither of theſe days are the true Equinoc day, indeed the *Syderial* is ſenſibly the ſa if it be but for ſome ſmall ſpace of time, t difference being only ſome fourths and fi of a degree ſlower in a day ; but the *Solar* notably longer than the other, *viz.* by 3', 56 53''', 19'''', of time in a day, and from hen the length of an hour is generally accounted Therefore to fit the *Pendulum* of a Watch Clock to this Solar day and hour : *I.* By t *Revolution of a fixed Star* to the ſame po again after one or more Revolutions (whi you muſt curiouſly obſerve by fixing your e to a point.) If the *Motion* for one Revolu want 3', 56'' of 24 hours, or for two, 7', 4 for three, 40', 39'', *&c.* then doth your Wa go true to the Equal or Middle Motion of t ☉, if otherwiſe, the *Pendulum* muſt be alte to make it go ſo. *II.* By a *Sun Dyal,* whi though it be made never ſo exact, and yo Motion ſo too, yet there will be a conſidera difference after ſome days, nay even in one d all which falls out by reaſon of the inequal of Natural Days, (which at laſt is ſettled a
John demonſtrated by Mr. ~~*William*~~ *Flamſted,*) fr whom (if God continue his health) Aſtro my hopes for a better Dreſs ; But this Man will not admit the Table of Equations, whi you may find in Monſieur *Huged's* Herolo whereto you are referred.

Laſtly, There is added a *Table of the Rig Aſcenſion of the* ☉, and a *Table of the Rig Aſcenſion of the Stars* of the greater Magnitu that when any of them come into the Me dian, by ſubſtracting that of the ☉ from t of the Star (adding 24 hours, if need be) lea the hour of the night.

And there is an *Excellent and uſeful Ta* the laſt of all, of 22 *Stars,* which here ne

c·4·

ſe or ſet, and are conſtantly ſeen, which able ſhews their right Aſcenſions, and their ime and Azimuth when they come under the *ole Star*; therefore if you hang up a Thred nd Plummet, and looking through a ſmall ole,(to take away the Stars ray) obſerve when ny of theſe Stars come with the Pole *Star* to hat Perpendicular: If you ſubſtract the ☉ ight Aſcenſion, from the hour of the Stars oming under the North Pole, you have the ue time of the Night to a minute. Many ther uſes may be made of this Table, but here is not room here to ſet them down.

The *Table of Right Aſcenſions of the* ☉ is ery exact to a ſecond, to every degree of the cliptick; and becauſe the North-Signs have he ſame Right Aſcenſion with their reſpective egrees of the South-Signs 12 hours difference: he Table is contracted, and the common parts o anſwer two Columns: For finding the *Part roportional* for the ☉ minutes, the differences re ſet down to ſeconds, and may be ſupplied rom the Table of Parts Proportional, if you nter the 10 differences under 6, as you did for he Log. under 10.

The Table of the Right Aſcenſions and De-linations of one hundred of the Principal fixed tars are rectified to the year 1680, and are ta-en from *Ricciolus* his laſt Book. Entituled, *A-ronomia Reformata*, are more exact than any ther extant, and have their Differences ſet by, or every ten years to rectifie them, and were hus done at the deſire of that Worthy and ble *Phyſician*, and incomparable *Mathema-ician*, Sir *Charles Scarborough*, for the benefit f the Induſtrious Seaman.

The laſt Table of the Stars about the North-ole, are calculated for the Latitude of *London*, nd for the year 1680. Any Artiſt may com-pute

pute them for other Latitudes, obſerving th
all ſuch Stars whoſe Right Aſcenſions are abov
9°, 14′, 10″, and under 189°, 14′, 10″, pa
the Meridian before they came under the Pol
Star, all the other Semicircles contrary. Thi
Table will be welcome to thoſe that make Ob
ſervations of the Stars, to know the true time
the night, and to rectifie their *Pendulum*
Watches by: To all whom let their Days an
Nights be fortunate.

Soli Deo Gloria.

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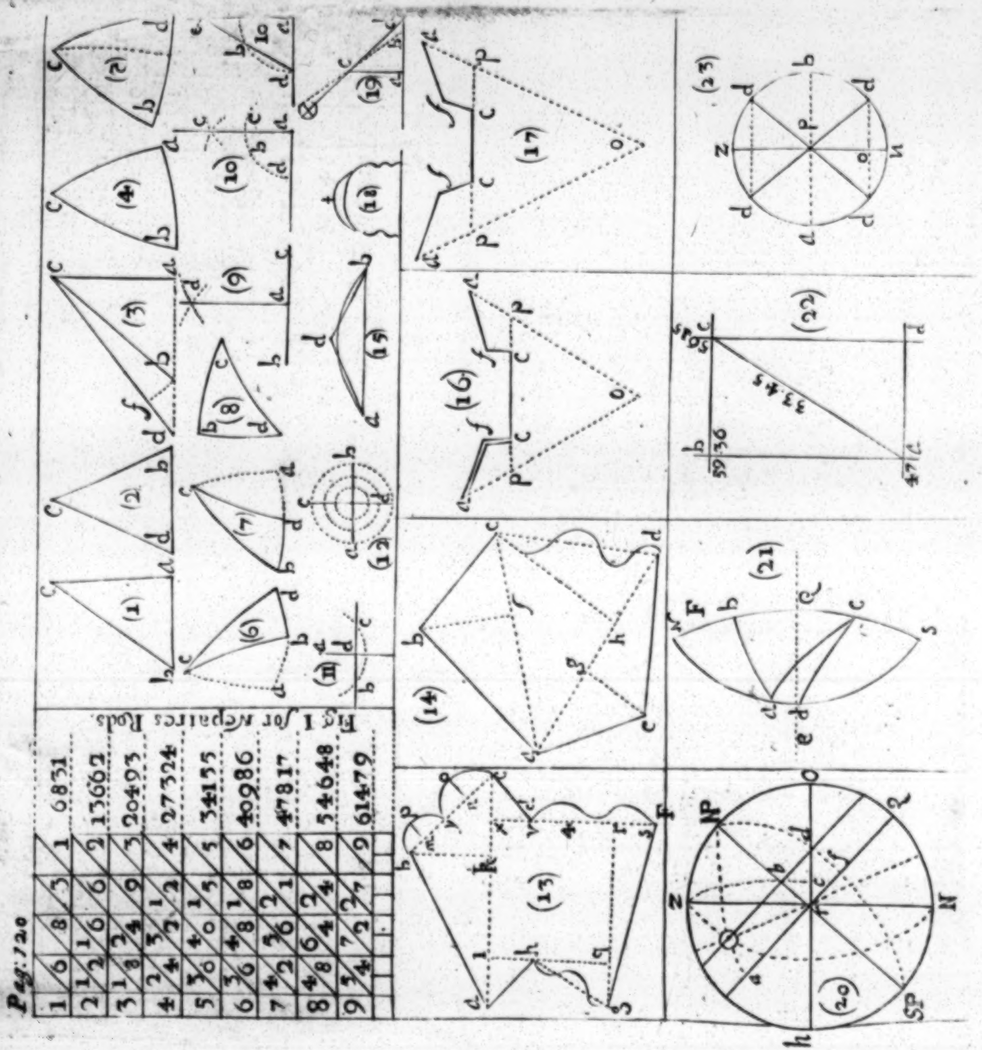

1	6	8	3	1	6831
2	1/2	1/6	6	2	13662
3	1/8	2/4	9	3	20493
4	2/4	3/2	1/2	4	27324
5	3/0	4/0	1/5	5	34155
6	3/6	4/8	1/8	6	40986
7	4/2	5/6	2/1	7	47817
8	4/8	6/4	2/4	8	54648
9	5/4	7/2	2/7	9	61479

Fig I for Napiers Rods.

Latituds of Places Pag.370

Arundel	51 00	London	51 32
Briſtoll	51 35	Leceſter	52 45
Buckingham	52 10	Lincoln	53 20
Bedford	52 15	Lancaſter	54 15
Canterbury	51 25	Notingham	53 00
Cheſter	53 20	Northampt:	52 24
Colcheſter	52 08	Norwich	52 45
Cambridg	52 20	Newcaſtle	55 12
Carliſle	55 20	Oxford	51 50
Dover	51 20	Portsmou:	51 08
Dorcheſter	50 50	Plimouth	50 36
Darby	53 00	Reding	51 40
Durham	55 00	Salſbury	51 12
Dublin	54 27	Stafford	52 50
Exceter	50 50	Shrowſbu:	52 50
Edenbro:	56 00	Stanford	52 44
Falmouth	56 22	Wincheste:	50 20
Gloceſter	52 00	Worceſter	52 25
Huntington	52 30	Warwick	52 30
Ipswich	52 20	Yorke	54 00

the Logarithms of all Numbers under 100000 may easily be ſupplied.

10
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Brigg's *Logarithms.*

[illegible] the Logarithms of all Numbers under 100000 may eaſily be ſupplied.

N	*Log.*	N	*Log.*	N	*Log.*
1	000000	34	531479	67	826075
2	301030	35	544068	68	832509
3	477121	36	556302	69	838849
4	602060	37	568202	70	845098
5	698970	38	579783	71	851258
6	778151	39	591065	72	857332
7	845098	40	602060	73	863323
8	903090	41	612784	74	869232
9	954242	42	623249	75	875061
10	000000	43	633468	76	880814
11	041393	44	643453	77	886491
12	079181	45	653212	78	892095
13	113943	46	662758	79	897627
14	146128	47	672098	80	903089
15	176091	48	681241	81	908485
16	204120	49	690916	82	913814
17	230449	50	698970	83	919078
18	255272	51	707570	84	924279
19	278753	52	716003	85	929419
20	301030	53	724276	86	934498
21	322219	54	732394	87	939519
22	342422	55	740363	88	944483
23	361728	56	748188	89	949390
24	380211	57	755875	90	954242
25	397940	58	763428	91	959041
26	414973	59	770852	92	963788
27	431364	60	778151	93	968483
28	447158	61	785330	94	973128
29	462398	62	792393	95	977724
30	477121	63	799341	96	982272
31	491361	64	805180	97	986771
32	505150	65	812913	98	991226
33	518514	66	819544	99	995635

Briggs's *Logarithms.*

N	0	1	2	3
100	000000	000434	000868	001301
101	004321	004751	005181	005609
102	008600	009026	009451	009876
103	012837	013259	013679	014100
104	017033	017451	017868	018284
105	021189	021603	022016	022428
106	025306	025715	026124	026533
107	029384	029789	030195	030600
108	033424	033826	034227	034628
109	037426	037825	038223	038620
110	041393	041787	042182	042575
111	045323	045714	046105	046495
112	049218	049605	049993	050308
113	053078	053456	053846	054230
114	056905	057283	057666	058046
115	060698	061075	061452	061829
116	064458	064832	065206	065580
117	058186	068557	068928	069298
118	071882	072250	072617	072985
119	075547	075912	076276	076640
120	079181	079543	079994	080266
121	082785	083144	083503	083861
122	086360	086716	087071	087426
123	089905	090258	090611	090963
124	093422	093772	094122	094471
125	096190	097257	097604	097951
126	100371	100715	101059	101403
127	103804	104145	104487	104828
128	107210	107549	107888	108227
129	110590	110926	111262	111598
130	113943	114277	114611	114944
131	117271	117603	117934	118265
132	120574	120903	121231	121560
133	123852	124178	124504	124830
134	127105	127429	127752	128076

6	7	8	9	D
002598	003029	003460	003891	432
006894	007321	007748	008174	428
011147	011570	011993	012415	424
015360	015779	016197	016615	420
019532	019947	020361	020775	416
023664	024075	024486	024896	411
027757	028164	028571	028978	408
031812	032216	032619	033021	404
035830	036229	036629	037028	401
039810	040207	040602	040998	397
043755	044148	044540	044931	393
047664	048053	048442	048830	390
051538	051924	052309	052694	386
055378	055760	056142	056524	383
059185	059562	059942	060320	379
062958	063333	063708	054083	376
066698	067071	067443	062814	373
070407	070776	071645	071514	370
074085	074451	074816	075182	366
077731	078094	078457	078819	364
081347	081707	082967	082426	361
084934	085291	085647	086004	357
088490	088845	089198	089552	355
092018	092369	092721	093071	352
095518	095866	096215	096562	349
098989	099335	099681	100026	347
102434	102777	103119	103462	344
105851	106191	106531	106870	341
109241	109578	109916	110253	338
112605	112940	113275	112609	335
115943	116276	116608	116940	332
119256	119586	119915	120245	330
122543	122871	123198	123525	328
125806	126131	126456	126781	325
129045	129368	129690	130012	323

N	0	1	2	3
135	130334	130655	130977	131298
136	133539	133858	134177	134496
137	136721	137037	137354	137671
138	139879	140194	140508	140822
139	143015	143327	143639	143951
140	146128	146438	146748	147058
141	149219	149527	149835	150142
142	152288	152594	152900	153205
143	155336	155640	155943	156246
144	158362	158664	158965	159266
145	161368	161667	161967	162266
146	164353	164650	164947	165244
147	167317	167613	167908	168203
148	170262	170555	170848	171141
149	173186	173478	173769	174060
150	176091	176318	176669	176939
151	178977	179264	179552	179839
152	181844	182129	182415	182699
153	184691	184975	185259	185542
154	187521	187803	188084	188366
155	190332	190612	190892	191171
156	193125	193403	193681	193959
157	195900	196176	196453	196729
158	198657	198932	199206	199481
159	201397	201670	201943	202216
160	204120	204391	204663	204934
161	206826	207096	207365	207634
162	209515	209783	210051	210319
163	212188	212454	212730	212986
164	214844	215109	215373	215638
165	217484	217747	218010	218273
166	220108	220370	220631	220892
167	222716	222976	223236	223496
168	225309	225563	225826	226048
169	227887	228143	228400	228657

5	6	7	8	9	D
939	132260	132580	132900	133219	321
133	135451	135768	136085	136403	319
303	138618	138934	139249	139564	316
450	141763	142076	142389	142702	314
574	144885	145195	145507	145818	311
676	147985	148294	148603	148911	309
746	151063	151370	151676	151982	307
815	154119	154424	154723	155032	305
852	157154	157457	157759	158061	303
868	160168	160469	150769	161068	301
863	163161	163459	163758	164055	298
838	166134	166430	166726	167022	297
792	169086	169380	169764	169968	295
725	172019	172311	172603	172895	292
641	174932	175222	175512	175802	290
535	177825	178113	178401	178689	289
413	180699	180986	181272	181558	287
270	183555	183839	184123	184407	285
108	186391	186674	186956	187239	283
928	189210	189409	189771	190051	281
730	192009	192289	192567	192845	279
514	194792	195069	195345	195623	278
231	197556	197832	198107	198382	276
029	200303	200577	200850	201124	274
761	203033	203305	203577	203848	272
475	205746	206016	206286	205556	271
73	208441	208701	208978	209247	269
53	211121	211388	211654	211921	267
18	213783	214049	214314	214579	266
16	216430	216694	216957	217221	264
98	219060	219323	219585	219846	262
14	221675	221936	222196	222456	261
15	224274	224533	224791	225051	260
00	226858	227115	227372	227630	258
70	229426	229682	229938	230194	257

N	0	1	2	3
170	230449	230704	230959	231215
171	232996	233250	233504	233757
172	235528	235781	236033	236285
173	238046	238297	238548	238799
174	240549	240799	241048	241297
175	243038	243286	243534	243782
176	245513	245759	246006	246252
177	247973	248219	248464	248709
178	250420	250664	250908	251151
179	252853	253096	253338	253580
180	255272	255514	255755	255996
181	257679	257[illegible]81	258158	258398
182	260071	260310	260548	260787
183	262451	262688	262925	263162
184	264818	265054	265290	265525
185	264172	267406	267641	267875
186	269513	269746	269980	270213
187	271842	272074	272306	272538
188	274158	274389	274620	274850
189	276462	276691	276921	277151
190	278754	278982	279210	279439
191	281033	281261	281488	281715
192	283301	283527	283753	283979
193	285557	285782	286007	286232
194	287802	288025	288249	288473
195	250035	290257	290480	290702
196	292256	292478	292699	292920
197	294466	294687	294907	295127
198	296665	296884	297104	297323
199	298853	299071	299289	299507
200	301030	301247	301464	301681
201	303196	303412	303628	303844
202	305351	305566	305781	305995
203	307496	307710	307927	308137
204	309630	309843	310056	310260

5	6	7	8	9	D
1724	231979	232233	232488	232742	254
4264	234517	234770	235023	235276	253
6789	237041	237292	237544	237795	252
9299	239550	239800	240050	240300	250
1795	242044	242293	242541	242790	249
4277	244524	244772	245019	245266	247
6745	246991	247236	247482	247728	246
9198	249443	249687	249932	250176	244
1638	251881	252125	252367	252610	243
4064	254306	254548	254790	255031	242
6477	256718	256958	257198	257439	241
8877	259116	259355	259594	259833	239
1263	261501	261738	261976	262214	238
3636	263873	264109	264345	264582	237
5996	266232	266467	266702	266937	235
8344	268578	268812	269046	269279	234
0679	270912	271144	271377	271609	233
3001	273233	273464	273696	273927	231
5311	275542	275772	276002	276232	230
7609	277838	278064	278296	278525	229
9895	280123	280351	280578	280806	228
2169	282395	282622	282849	283075	227
4431	284656	284882	285107	285332	226
6681	286905	287130	287354	287578	225
8920	289143	289366	289589	289812	224
1147	291369	291591	291831	292034	222
3363	293583	293084	294015	294246	221
5567	295787	296007	296226	295446	220
7760	297979	298198	298416	298635	219
9943	300160	300373	300595	300813	218
2114	302331	302547	302764	302980	217
4275	304490	304706	304921	305136	216
6425	306639	306854	307068	307282	215
8564	308778	308991	309204	309417	213
0693	310906	311118	311330	311542	212

N	0	1	2	3
205	311754	311966	312177	312389
206	313867	314078	314289	314499
207	315970	316180	316390	316599
208	318063	318272	318481	318689
209	320146	320354	320562	320769
210	322219	322426	322633	322839
211	324282	324488	324694	324899
212	326336	326541	326745	326950
213	328380	328583	328787	328991
214	330414	320617	350819	331022
215	332430	332640	332842	333044
216	333454	334655	334856	335057
217	336460	336660	336860	337060
218	338456	338656	338855	339054
219	330444	340642	340841	341039
220	342423	342620	342817	343014
221	344392	344589	344785	344981
222	346353	346549	346744	346939
223	348305	348500	348694	348889
224	350248	350441	350636	350829
225	352183	352375	352568	352761
226	354108	354301	354493	354685
227	356026	356217	356403	356599
228	357935	358125	358316	358506
229	359835	360025	360215	360404
230	361728	361917	362105	362294
231	363612	363800	363988	364176
232	365488	365675	365862	366049
233	367356	367542	367729	367915
234	369216	369101	369587	369772
235	371069	371253	371437	371622
236	372912	373096	373280	373464
237	374748	374932	375115	375298
238	376577	376759	376942	377124
239	378398	378580	378761	378952

5	6	7	8	9	D
2812	313234	313023	313445	313656	211
4920	315130	315340	315551	315760	210
7018	317227	317436	317646	317854	209
9106	319314	319522	319730	319938	209
1184	321391	321598	321805	322012	207
3252	323458	323665	323871	324077	106
5310	325511	325721	325926	326131	205
7359	327563	327767	327972	328176	204
9398	329601	329805	330008	330211	203
1427	331630	331832	332034	332236	202
3447	333649	333859	335051	334253	202
5458	335658	335859	336059	336260	201
7459	337659	337858	338058	348257	200
9451	339650	339849	340047	340246	199
1435	341632	341830	342028	342225	198
3409	343606	343802	343999	344196	197
5374	345570	345766	345962	346157	196
7330	347525	347720	347915	348110	195
9278	349572	349660	349850	350054	194
1216	351410	351603	351796	351989	193
3147	353 39	353532	353724	353916	193
5068	355260	355452	355643	355834	192
6981	357172	357363	357554	357744	191
8886	359076	359266	359456	369646	190
0783	360972	361161	361350	361539	189
2571	362859	363048	363236	363424	188
4551	364739	364925	365113	365301	188
6423	366610	366795	366983	367169	187
8287	368473	368659	368845	369030	186
0143	370328	370513	370698	370883	185
1991	372175	372359	372544	372728	184
3831	374015	374198	374382	374565	184
5664	375846	376029	376212	376394	183
7488	377670	377852	378034	378216	182
9306	379487	379668	379849	380030	181

N	0	1	2	3
240	380211	380392	380573	380754
241	382017	382197	382377	382557
242	383815	383995	384174	384353
243	385606	385785	385964	386142
244	387390	387568	387746	387923
245	389166	389343	389520	389697
246	390935	391112	391288	391464
247	392697	392873	393048	393224
248	394452	394627	394802	394977
249	396199	396374	396548	396722
250	397940	398114	398287	398461
251	399674	399847	400020	400192
252	401400	401573	401745	401917
253	403120	403297	403464	403635
254	404834	405005	405176	405346
255	406540	406710	406881	407051
256	408240	408410	408579	408749
257	409933	410102	410271	410440
258	411620	411788	411957	412124
259	413300	413467	413635	413802
260	414973	415140	415307	415474
261	416640	416807	416973	417139
262	418301	418467	418633	418798
263	419956	420121	420286	420451
264	421604	421768	421933	422097
265	423246	423410	423573	423737
266	424882	425045	425208	425371
267	426511	426674	426836	426999
268	428135	428297	428459	428621
269	429752	429914	430075	430236
270	431364	431525	431685	431846
271	432969	433129	433290	433450
272	434569	434728	434888	435048
275	436163	436322	436481	436640
274	437751	437909	438067	438226

5	6	7	8	9	N
1115	381296	381476	381656	381837	181
2917	383097	383277	383456	383636	180
4712	384891	385070	385249	385427	179
6499	386677	386856	387034	387212	178
8279	388456	388634	388811	388982	178
0051	390228	390405	390582	390758	177
1817	391993	392169	392345	392521	176
3575	393751	393925	394101	394176	176
5326	395501	395676	395850	356025	175
7060	397245	397418	397592	397766	174
8808	398981	399654	399327	399501	173
0538	400711	400883	401056	401218	173
2261	402433	402605	402777	402929	172
3978	404149	404320	404492	404663	171
5688	405858	406029	406199	406370	171
7391	407561	407731	407900	408070	170
9087	409257	409426	409595	409764	169
10777	410946	411114	411283	411451	169
12460	412628	412796	412964	413132	168
14137	414305	414472	414639	414806	167
15808	415974	416141	416308	416474	167
17472	417638	417804	417970	418135	166
19129	419295	419460	419625	419791	165
20781	420945	421110	421275	421439	165
22426	422590	422754	422918	423082	164
24064	424228	424392	424555	424718	164
25697	425860	426023	426186	426349	163
27324	427486	427648	427811	427973	162
28944	429106	429268	429429	429591	162
30559	430720	430881	431042	431203	161
32167	432338	432488	432649	432809	160
33770	433930	434090	434249	434409	160
35366	435526	435685	435844	436003	159
36957	437119	437275	437433	437592	159
38542	438700	438859	439017	439175	158

N	0	1	2	3
275	439333	439491	439648	439806
276	440909	441066	441224	441381
277	442480	442637	442793	442950
278	444045	444201	444357	444513
279	445604	445759	445915	446071
280	447158	447313	447468	447623
281	448706	448861	449015	449170
282	450249	450403	450557	450711
283	451786	451940	452093	452247
284	453318	453471	453624	453777
285	454845	454997	455149	455302
286	456366	456518	456670	456821
287	457882	458033	458184	458336
288	459392	459543	459694	459845
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506	704151	704236	704322	704408	70449
507	705008	705094	705179	705265	70535
508	705864	705949	706035	706120	70620
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510	707570	707655	707740	707826	70791
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512	709270	709355	709440	709524	70960
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C

Briggs's *Logarithms.*

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637	804139	804208	804276	804344	80441
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3798	803867	803935	804003	804071	68
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943297	943346	943395	943445	49
943791	943841	943890	943939	49
944285	944335	944384	944433	49
944779	944828	944877	944927	49
945272	945321	945370	945419	49
945764	945813	945862	945911	49
946256	946305	946354	946403	49
946747	946796	946845	946894	49
947238	947278	947336	947385	49
947728	947777	947826	947875	49
948217	948266	948315	948364	49
948706	948755	948804	948853	49
949195	949245	949292	949341	49
949683	949731	949780	949829	49
950170	950219	950267	950316	49
950657	950706	950754	950803	49
951143	951192	951240	951289	49
951629	951677	951729	951775	49
952114	952163	952211	952259	49
952599	952647	952695	952744	48
953083	953131	953180	953228	48
953566	953615	953663	953711	48
954049	954098	954145	954194	48
954532	954580	954628	954977	48
955214	955062	955110	955158	48
955495	955543	955591	955640	48
955976	956024	956072	956120	48
956457	956505	956553	956601	48

N	0	1	2	3	4
905	956649	956697	956745	956793	955
906	957128	957176	957224	957272	957
907	957607	957655	957703	957751	957
908	958086	958134	958181	958229	958
909	958564	958612	958659	958707	958
910	959041	959089	959137	959184	959
911	959518	959566	959614	959661	959
912	959995	960042	960090	960138	960
913	960471	960518	960566	960613	960
914	960946	960994	961041	961089	961
915	961421	961468	961516	961563	961
916	961895	961934	961990	962038	962
917	962369	962417	962464	962511	962
918	962843	962890	962937	962985	963
919	963315	963363	963410	963457	963
920	963788	963835	963882	963929	963
921	964260	964307	964354	964401	964
922	964731	964778	964825	964872	964
923	965202	965249	965296	965343	965
924	965672	965719	965766	965813	965
925	966142	966189	966236	966283	966
926	966611	966658	966705	966752	966
927	967080	967127	967173	967220	967
928	967548	967595	967642	967688	967
929	968016	968062	968109	968156	968
930	968483	968530	968576	968623	968
931	968950	968996	969043	969090	969
932	969416	969463	969509	969556	969
933	969882	969928	969975	970021	970
934	970347	970393	970440	970486	970
935	970812	970858	970904	970951	970
936	971276	971322	971369	971415	971
937	971740	971786	971832	971879	971
938	972203	972249	972295	972342	972
939	972666	972712	972758	972804	972

5	6	7	8	9	D
8885	956936	956984	957032	957080	48
7368	957416	957464	957512	957559	48
7847	957894	957942	957990	958038	48
8325	958373	958421	958468	958516	48
8803	958850	958898	958946	958994	48
9280	959328	959375	959423	959171	48
9757	959804	959852	959900	959947	48
0235	960280	960328	960376	960423	48
0709	960756	960804	960851	960899	48
1184	961231	961279	961326	961374	47
1658	961706	961753	961801	961848	47
2132	962180	962227	962275	962322	47
2606	962653	962701	962748	962795	47
3079	963126	963174	963221	963268	47
3552	963599	963646	963693	963741	47
4024	964071	964118	964165	964212	47
4495	964542	964590	964637	964684	47
4966	965013	965061	965108	965155	47
5437	965484	965531	965578	965624	47
5907	965954	966001	966048	966095	47
6376	966423	966470	966517	966564	47
6845	966892	966939	966985	967033	47
7314	967361	967408	967454	967501	47
7782	967829	967875	967922	967969	47
8249	968296	968343	968389	968436	47
8716	968763	968810	968856	968903	47
9183	969229	969276	969323	969369	47
9649	969695	969742	969789	969835	47
0114	970161	970207	970254	970300	47
0579	970626	970672	970719	970765	46
1044	971090	971137	971183	971229	46
1508	971554	971601	971647	971693	46
1971	972018	972064	972110	972157	46
2434	972481	972527	972573	972619	46
2897	972943	972989	973035	973082	46

N	0	1	2	3
940	973128	973174	973220	973266
941	973550	973636	973682	973728
942	974051	974097	974143	974189
943	974512	974558	974604	974650
944	974972	975018	975064	975110
945	975432	975478	975524	975570
946	975891	975937	975483	976029
947	975350	976396	975442	976488
948	976828	976854	976899	976946
949	977266	977312	977358	977403
950	977724	977769	977815	977861
951	978181	978226	978272	978317
952	978637	978683	978728	978774
953	979093	979138	979184	979230
954	979548	979594	979639	979685
955	980003	980049	980094	980140
956	980458	980503	980539	980594
957	980912	980957	981003	981048
958	981366	981411	981456	981501
959	981819	981864	981909	981954
960	982271	982316	980094	982407
961	982723	982769	982814	982859
962	983175	983220	983265	983310
963	983626	983671	983716	983762
964	984077	984122	984167	984212
965	984527	984572	984617	984662
966	984977	985022	985067	985112
967	985426	985471	985516	985561
968	985875	985920	985965	986010
969	986324	986369	986413	986458
970	986772	986816	98·861	986906
971	987219	987264	987309	987353
972	987666	987711	987756	987800
973	988113	988157	988202	988247
974	988559	988604	988648	988693

5	6	7	8	9	D
973359	973405	973451	973497	973543	46
973820	973866	973913	973959	974005	46
974281	974327	974374	974420	974465	46
974742	974788	974834	974880	974925	46
975202	975248	975294	975340	975386	46
975662	975707	975753	975799	975845	46
976121	976167	976212	976258	976304	46
976579	976625	976671	976717	976763	46
977037	977083	977129	977175	977220	46
977495	977541	977586	977632	977678	46
977952	977998	978043	978089	978135	46
978409	978454	978500	978546	978591	46
978865	978911	978956	979002	979047	46
979321	979366	979412	979457	979503	46
979776	979821	979867	979912	979958	46
980231	980276	980322	980367	980412	45
980685	980730	980776	980821	980867	45
981139	981184	981229	981275	981320	45
981592	981637	981683	981728	981773	45
982045	982090	982135	982181	982226	45
982467	982543	982588	982633	982678	45
982949	982994	983040	983085	983130	45
983401	983446	983491	983536	983581	45
983852	983897	98 942	983987	984032	45
984302	984347	984392	984437	984482	45
984752	984797	984842	984887	984932	45
985202	985247	985292	985337	985382	45
985651	985696	985741	985786	985830	45
986100	986144	986189	986324	986279	45
986548	986593	986637	986682	986707	45
986996	987040	987085	987130	987175	45
987443	987488	987522	987577	987622	45
987890	987934	987979	988024	988068	45
988336	988381	988425	988470	988514	45
988782	988826	988871	988916	988960	45

N	0	1	2	3	4
975	989005	989049	989094	989138	98918
976	989450	989494	989539	989583	98962
977	989895	989939	989983	980028	99007
978	990339	990383	990428	990472	99051
979	990783	990827	990871	990916	99096
980	991226	991270	991315	991359	99140
981	991669	991713	991757	991802	99184
982	992111	992156	992200	992244	99228
983	992554	992598	992642	992686	9927
984	992995	993039	993083	993127	9931
985	993436	993480	993524	993568	9936
986	993877	993921	993965	994009	9940
987	994317	994361	994405	994449	9944
988	994757	994801	994845	994889	9949
989	995196	995240	995284	995328	9953
990	995635	995679	995723	995767	995
991	996074	996117	996161	996205	9962
992	996522	996555	996599	996643	9966
993	996949	996993	997037	997080	997
994	997386	997430	997474	997517	997
995	997823	997867	997910	997954	997
996	998259	998303	998346	998390	998
997	998695	998739	998782	998826	998
998	999130	999174	999218	999261	999
999	999565	999609	999652	999695	999

End of the Table

6	7	8	9	D
989372	989316	989361	989405	45
989717	989761	989806	989850	44
990161	990206	990250	990294	44
990605	990650	990694	990738	44
991509	991093	991137	991182	44
991492	991536	991580	991625	44
991934	991979	992023	992067	44
992377	992421	992465	992509	44
992819	992863	992907	992951	44
993260	993304	993348	993392	44
993701	993745	993789	993833	44
994141	994185	994229	994273	44
994581	994625	994669	994713	44
995021	995065	995108	995152	44
995460	995504	995547	995591	44
995898	995942	995986	996030	44
995337	995380	996424	996468	44
996774	996818	996862	996906	44
997212	997255	997299	997043	44
997648	997692	997736	997779	44
998085	998129	998172	998216	44
998521	998564	998608	998652	44
998956	999000	999043	999087	44
999392	999435	999479	999522	44
999826	999870	999913	999956	44

Of Logarithms.

Here followeth

A TABLE

OF

Parts Proportiona

FOR

The finding the Logarithms of
Numbers, betwixt 10000
100000.

Parts Proportional.

D	1	2	3	4	5	6	7	8	9
43	4	8	12	17	21	25	30	34	38
44	4	8	13	17	22	26	30	35	39
45	4	9	13	18	22	27	31	36	40
46	4	9	13	18	23	27	32	36	41
47	4	9	14	18	23	28	32	37	42
48	4	9	14	19	24	28	33	38	43
49	4	9	14	19	24	29	34	39	44
50	5	10	15	20	25	30	35	40	45
51	5	10	15	20	25	30	35	40	45
52	5	10	15	20	26	31	36	41	46
53	5	10	15	21	26	31	37	42	47
54	5	10	16	21	27	32	37	43	48
55	5	11	16	22	27	33	38	44	49
56	5	11	16	22	28	33	39	44	50
57	5	11	17	22	28	34	39	45	51
58	5	11	17	23	29	34	40	46	52
59	5	11	17	23	29	35	41	47	53
60	6	12	18	24	30	36	42	48	54
61	6	12	18	24	30	36	42	48	54
62	6	12	18	24	31	37	43	49	55
63	6	12	18	25	31	37	44	50	56
64	6	12	19	25	32	38	44	51	57
65	6	13	19	26	32	39	45	52	58
66	6	13	19	26	33	39	46	52	59
67	6	13	20	26	33	40	46	53	60
68	6	13	20	27	34	40	47	54	61
69	6	13	20	27	34	41	48	55	62
70	7	14	21	28	35	42	49	56	63
71	7	14	21	28	35	42	49	56	63
72	7	14	21	28	36	43	50	57	64
73	7	14	21	29	36	43	51	58	65
74	7	14	22	29	37	44	51	59	66
75	7	15	22	30	37	45	52	60	67
76	7	15	22	30	38	45	53	60	68

Parts Proportional.

D	1	2	3	4	5	6	7	8	9
77	7	15	23	30	38	46	53	61	69
78	7	15	23	31	39	46	54	62	70
79	7	15	23	31	39	47	55	63	71
80	8	16	24	32	40	48	56	64	72
81	8	16	24	32	40	48	56	64	72
82	8	16	24	32	41	49	57	65	73
83	8	16	24	33	41	49	58	66	74
84	8	16	25	33	42	50	58	67	75
85	8	17	25	34	42	51	59	68	76
86	8	17	25	34	43	51	59	68	77
87	8	17	26	34	43	52	60	69	78
88	8	17	26	35	44	52	61	70	79
89	8	17	26	35	44	53	62	71	80
90	9	18	27	36	45	54	63	72	81
91	9	18	27	36	45	54	63	72	81
92	9	18	27	36	46	55	64	73	82
93	9	18	27	37	46	55	65	74	83
94	9	18	28	37	47	56	65	75	84
95	9	19	28	38	47	57	66	76	85
96	9	19	28	38	48	37	67	76	86
97	9	19	29	38	48	58	67	77	87
98	9	19	29	39	49	58	68	78	88
99	9	19	29	39	49	59	69	79	89
100	10	20	30	40	50	60	70	80	90
101	10	20	30	40	50	60	70	80	90
102	10	20	30	40	51	61	71	81	91
103	10	20	30	41	51	61	72	82	92
104	10	20	31	41	52	62	72	83	93
105	10	21	31	42	52	63	73	84	94
106	10	21	31	42	53	63	74	84	95
107	10	21	32	42	53	64	74	85	96
108	10	21	32	43	54	64	75	86	97
109	10	21	32	43	54	65	76	87	98
110	11	22	33	44	55	66	77	88	99

Parts Proportional.

1	2	3	4	5	6	7	8	9
11	22	33	44	55	66	77	88	99
11	22	33	44	56	67	78	89	100
11	22	33	45	57	67	78	90	101
11	22	34	45	57	68	79	91	102
11	23	34	46	57	69	80	92	103
11	23	34	46	58	69	81	92	104
11	23	35	46	58	70	81	93	105
11	23	35	47	59	70	82	94	106
11	23	35	47	59	71	83	95	107
12	24	36	48	60	72	84	96	108
12	24	36	48	60	72	84	96	108
12	24	36	48	61	73	85	97	109
12	24	36	48	61	73	86	98	110
12	24	37	49	62	74	86	99	111
12	25	37	50	62	75	87	100	112
12	25	37	50	63	75	88	100	113
12	25	38	50	63	76	88	101	114
12	25	38	51	64	76	89	102	115
12	25	38	51	64	77	90	103	116
13	25	39	52	65	78	91	104	117
13	26	39	52	65	78	91	104	117
13	26	39	52	66	79	92	105	118
13	26	39	53	66	79	93	106	119
13	26	40	53	67	80	93	107	120
13	27	40	54	67	81	94	108	121
13	27	40	54	68	81	95	108	122
13	27	41	54	68	82	95	109	123
13	27	41	55	69	82	96	110	124
13	27	41	55	69	83	97	111	125
14	28	42	56	70	84	98	112	126
14	28	42	56	70	84	98	112	126
14	28	42	56	71	85	99	113	127
14	28	42	57	71	85	100	114	128
14	28	43	57	72	86	100	115	129

Parts Proportional.

D	1	2	3	4	5	6	7	8	9
145	14	28	43	58	72	87	101	116	
146	14	29	43	58	73	87	102	116	
147	14	29	44	58	73	88	102	117	
148	14	29	44	59	74	88	103	118	
149	14	29	44	59	74	89	104	119	
150	15	30	45	60	75	90	105	120	
151	15	30	45	60	75	90	105	120	
152	15	30	45	60	76	91	106	121	
153	15	30	45	60	76	91	107	122	
154	15	30	46	61	77	92	107	123	
155	15	31	46	62	77	93	108	124	
156	15	31	46	62	78	93	109	124	
157	15	31	47	62	78	94	109	125	
158	15	31	47	63	79	94	110	126	
159	15	31	47	63	79	95	111	127	
160	16	32	48	64	80	96	112	128	
161	16	32	48	64	80	96	112	128	
162	16	32	48	65	81	97	113	129	
163	16	32	48	65	82	98	114	130	
164	16	32	49	66	82	98	114	131	
165	16	33	49	66	82	99	115	132	
166	16	33	49	66	83	99	116	132	
167	16	33	50	66	83	100	116	133	
168	16	33	50	67	84	100	117	134	
169	16	33	50	67	84	101	118	135	
170	17	34	51	68	85	102	119	136	
171	17	34	51	68	85	102	119	136	
172	17	34	51	68	86	103	120	137	
173	17	34	51	69	86	103	121	138	
174	17	34	52	69	87	104	121	139	
175	17	35	52	70	87	105	122	140	
176	17	35	52	70	88	105	123	140	
177	17	35	53	70	88	106	123	141	
178	17	35	53	71	89	106	124	142	

Parts Proportional.

1	2	3	4	5	6	7	8	9
17	35	53	71	89	107	125	143	161
18	36	54	72	90	108	126	144	162
18	36	54	72	90	108	126	144	162
18	36	54	72	91	109	127	145	163
18	36	54	73	91	109	128	146	164
18	36	55	73	92	110	128	147	165
18	37	55	74	92	111	129	148	166
18	37	55	74	93	111	130	148	167
18	37	56	74	93	112	130	149	168
18	37	56	75	94	112	131	150	169
18	37	56	75	94	113	132	151	170
19	38	57	76	95	114	133	152	171
19	38	57	76	95	114	133	152	171
19	38	57	76	96	115	134	153	172
19	38	57	77	96	115	235	154	173
19	38	58	77	97	116	135	155	174
19	39	58	78	97	117	136	156	175
19	39	59	78	98	117	136	156	176
19	39	59	78	98	118	137	157	177
19	39	59	79	99	118	138	158	178
19	39	59	79	99	119	139	159	179
20	40	60	80	100	120	140	160	180
20	40	60	80	100	120	140	160	180
20	40	60	80	101	121	141	161	181
20	40	60	81	101	121	142	162	182
20	40	61	81	102	122	142	163	183
20	41	61	82	102	123	143	164	184
20	41	61	82	103	123	144	164	185
20	41	62	82	103	124	144	165	186
20	41	62	83	104	124	145	166	187
20	41	62	83	104	125	146	167	188
21	42	63	84	105	126	147	168	189
21	42	63	84	105	126	147	168	189
21	42	63	84	106	127	148	169	190

Parts Proportional.

D	1	2	3	4	5	6	7	8	9
213	21	42	63	85	106	127	149	170	19
214	21	42	64	85	107	128	149	171	19
215	21	43	64	86	107	129	150	172	19
216	21	43	64	86	108	129	151	172	19
217	21	43	65	86	108	130	151	173	19
218	21	43	65	87	109	130	152	174	19
219	21	43	65	87	109	131	153	175	19
220	22	44	66	88	110	132	154	176	19
221	22	44	66	88	110	132	154	176	19
222	22	44	66	88	111	133	155	177	19
223	22	44	66	89	111	133	156	178	20
224	22	44	67	89	112	134	156	179	20
225	22	45	67	90	112	135	157	180	20
226	22	45	67	90	113	135	158	180	20
227	22	45	68	90	113	136	158	181	20
228	22	45	68	91	114	136	159	182	20
229	23	45	68	91	114	137	160	183	20
230	23	45	69	92	115	138	161	184	20
231	23	46	69	92	115	138	161	184	20
232	23	46	69	92	116	139	162	185	20
233	23	46	69	93	116	139	163	186	20
234	23	46	70	93	117	140	163	187	21
235	23	47	70	94	117	141	164	188	21
236	23	47	70	94	118	141	165	188	21
237	23	47	71	94	118	142	165	189	21
238	23	47	71	95	119	142	166	190	21
239	24	47	71	95	119	143	167	191	21
240	24	48	72	96	120	144	168	192	21
241	24	48	72	96	120	144	168	192	21
242	24	48	72	96	121	145	169	193	21
243	24	48	72	97	121	145	170	194	21
244	24	48	73	97	122	146	170	195	21
245	24	49	73	98	122	147	171	196	22
246	24	49	73	98	123	147	172	196	22

Parts Proportional.

D	1	2	3	4	5	6	7	8	9
47	24	49	74	98	123	148	172	197	222
48	24	49	74	99	124	148	173	198	223
49	24	49	74	99	124	149	174	199	224
50	25	50	75	100	125	150	175	200	225
51	25	50	75	100	125	150	175	200	225
52	25	50	75	100	126	151	176	201	226
53	25	50	75	101	126	151	177	202	227
54	25	50	76	101	127	152	177	203	228
55	25	50	76	102	127	153	178	204	229
56	25	51	76	102	128	153	179	204	230
57	25	51	77	102	128	154	179	205	231
58	25	51	77	103	129	154	180	206	232
59	25	51	77	103	129	155	181	207	233
60	26	52	78	104	130	156	182	208	234
61	26	52	78	104	130	156	182	208	234
62	26	52	78	104	131	156	183	209	235
63	26	52	78	105	131	157	184	210	236
64	26	52	79	105	132	158	184	211	237
65	26	53	79	106	132	159	185	212	238
66	26	53	79	106	133	159	186	212	239
67	26	53	80	106	133	160	186	213	240
68	26	53	80	107	134	160	187	214	241
69	26	53	80	107	134	161	188	215	242
70	27	54	81	108	135	162	189	216	243
71	27	54	81	108	135	162	189	216	243
72	27	54	81	108	136	163	190	217	244
73	27	54	81	109	136	163	191	218	245
74	27	54	82	109	137	164	191	219	246
75	27	55	82	110	137	165	192	220	247
76	27	55	82	110	138	165	193	220	248
77	27	55	83	110	138	166	193	221	249
78	27	55	83	111	139	166	194	222	250
79	27	55	83	111	139	167	195	223	251
80	28	56	84	112	140	168	196	224	252

Parts Proportional.

D	1	2	3	4	5	6	7	8	9
281	28	56	84	112	140	168	196	224	252
282	28	56	84	112	141	169	197	225	253
283	28	56	84	113	141	169	198	225	254
284	28	56	85	113	142	170	168	227	255
285	28	57	85	114	142	171	199	228	256
285	28	57	85	114	143	171	200	228	257
287	28	57	86	114	143	172	200	229	258
288	28	57	86	115	144	172	201	230	259
289	28	57	86	115	144	173	202	231	260
290	29	58	87	116	145	174	203	232	261
291	29	58	87	116	145	174	203	232	261
292	29	58	87	116	146	175	204	233	262
293	29	58	87	117	146	175	205	234	263
294	29	58	88	117	147	176	205	235	264
295	29	59	88	118	147	177	206	236	265
296	29	59	88	118	148	177	607	236	266
297	29	59	88	118	143	178	207	237	267
298	29	59	89	119	149	178	208	238	268
299	29	59	89	119	149	179	209	239	269
300	30	60	90	120	150	180	210	240	270
301	30	60	90	120	150	180	210	240	270
302	30	60	90	120	151	181	211	241	271
303	30	60	90	121	151	181	212	242	272
304	30	60	91	121	152	182	212	243	273
305	30	61	91	122	152	183	213	244	274
306	30	61	91	122	153	183	214	244	275
307	30	61	92	122	153	184	214	245	276
308	30	61	92	123	154	184	215	246	277
309	30	61	92	123	154	185	216	247	278
310	31	62	93	124	155	186	217	248	279
311	31	62	93	124	155	186	217	248	279
312	31	62	93	124	156	187	218	249	280
313	31	62	93	125	156	187	219	250	281
314	31	62	94	125	157	188	219	251	282

Parts Proportional.

D	1	2	3	4	5	6	7	8	9
315	31	63	94	126	157	189	220	252	283
316	31	63	94	126	158	189	221	252	284
317	31	63	95	125	158	190	221	253	285
318	31	63	95	127	159	190	222	254	286
319	31	63	95	127	159	191	223	255	287
320	32	64	95	128	160	192	224	256	288
321	32	64	96	128	160	192	224	256	288
322	32	64	96	128	161	193	225	257	289
323	32	64	96	129	161	193	226	258	290
324	32	64	97	129	162	194	225	259	291
325	32	65	97	130	162	195	227	260	292
326	32	65	97	130	163	195	228	250	293
327	32	65	98	130	163	196	228	261	294
328	32	65	98	131	163	196	229	262	295
329	32	65	98	131	164	197	230	263	295
330	33	66	99	132	165	198	221	264	297
331	33	66	99	132	165	198	231	264	297
332	33	66	99	132	165	199	232	265	298
333	33	66	99	133	166	199	233	266	299
334	33	66	100	133	167	200	233	267	300
335	33	67	100	134	167	201	234	268	301
336	33	67	100	134	168	201	235	268	302
337	33	67	101	134	168	202	235	269	303
338	33	67	101	135	169	202	236	270	304
339	33	67	101	135	169	203	237	271	305
340	34	68	102	136	170	304	238	272	306
341	34	68	102	136	170	204	238	272	306
342	34	68	102	136	171	205	239	273	307
343	34	68	102	637	171	205	240	274	308
344	34	68	103	137	172	206	240	275	309
345	34	69	103	138	172	207	241	276	310
346	34	69	103	138	173	207	242	276	311
347	34	69	104	138	273	208	242	277	312
348	34	69	104	139	174	208	243	278	313

Parts Proportional.

D	1	2	3	4	5	6	7	8
349	34	69	104	139	174	209	244	279
350	34	70	105	140	175	210	245	280
351	35	70	105	140	175	210	245	280
352	35	70	105	140	176	211	246	281
353	35	70	105	141	176	211	247	282
354	35	70	106	141	177	212	247	283
355	35	71	106	142	177	213	248	284
356	35	71	105	142	178	213	249	284
357	35	71	107	142	178	214	249	285
358	35	71	107	143	179	214	250	286
359	35	71	107	143	179	215	251	287
360	35	72	108	144	180	216	251	288
361	36	72	108	144	180	216	252	288
362	36	72	108	144	181	217	252	289
363	36	72	108	145	181	217	253	290
364	36	72	109	145	182	218	254	291
365	36	73	109	146	182	219	254	292
366	36	73	109	146	182	219	255	292
367	36	73	110	146	183	220	256	293
368	36	73	110	147	184	220	255	294
369	36	73	110	147	184	221	257	295
370	36	74	111	148	185	222	258	296
371	37	74	111	148	185	222	259	295
372	37	74	111	148	186	223	260	297
373	37	74	111	149	185	223	251	298
374	37	74	112	149	187	224	251	299
375	37	75	112	150	187	225	262	300
376	37	75	112	150	188	225	252	300
377	37	75	113	150	188	226	263	301
378	37	75	113	151	189	225	254	302
379	37	75	113	151	189	227	265	303
380	37	76	114	152	190	228	256	304
381	38	76	114	152	190	228	266	304
382	38	76	114	152	191	229	257	305

Parts Proportional.

1	2	3	4	5	6	7	8	9
38	76	114	153	191	229	268	306	344
38	76	115	153	192	230	268	307	345
38	77	115	154	192	231	269	308	346
38	77	115	154	193	231	270	308	347
38	77	116	154	193	232	270	309	348
38	77	116	155	194	232	271	310	349
38	77	116	155	194	233	272	311	350
39	78	117	156	195	233	273	312	351
39	78	117	156	195	233	273	312	351
39	78	117	156	196	234	274	313	352
39	78	117	157	196	235	275	314	353
39	78	118	157	197	236	275	315	354
39	79	118	158	197	237	276	316	355
39	79	118	158	198	237	277	316	356
39	79	119	158	198	238	277	317	357
39	79	119	159	199	238	278	318	358
39	79	119	159	199	239	279	319	359
40	80	120	160	200	240	280	320	360
40	80	120	160	200	240	280	320	360
40	80	120	160	201	241	281	321	361
40	80	120	161	201	241	282	322	362
40	80	121	161	202	242	282	323	363
40	81	121	162	202	243	283	324	364
40	81	21	162	203	243	284	324	365
40	81	122	162	203	244	284	325	366
40	81	122	153	204	244	285	326	367
40	81	122	163	204	245	286	327	368
41	82	123	164	205	246	287	328	369
41	82	123	164	205	246	287	328	369
41	82	123	164	206	247	288	329	370
41	82	123	165	206	247	289	330	371
41	82	124	165	207	248	289	331	372
41	82	124	166	207	249	290	332	373
41	83	124	166	208	249	291	332	374

Parts Proportional.

D	1	2	3	4	5	6	7	8
417	41	83	125	166	208	250	291	333
418	41	83	125	167	209	250	292	334
419	41	83	125	167	209	251	293	335
420	42	84	126	168	210	252	294	336
421	42	84	126	168	210	252	294	336
422	42	84	126	168	211	253	295	337
423	42	84	125	169	211	253	296	338
424	42	84	127	169	212	254	296	339
425	42	85	127	170	212	255	297	340
426	42	85	127	170	213	255	298	340
427	42	85	128	170	213	256	298	341
428	42	85	128	171	214	256	299	342
429	42	85	128	171	214	257	300	343
430	43	86	129	172	215	258	301	344
431	43	86	129	172	215	258	301	344
432	43	86	129	172	216	259	302	345
433	43	86	129	173	216	259	303	346
434	43	86	130	173	217	260	304	347
435	43	87	130	174	217	261	304	348

A
TABLE
OF
Artificial Sines
AND
TANGENTS,

For every
Degree and Minute
OF THE
QUADRANT,
Fitted to the Size
OF THE
LOGARITHMS.

Degree 0.

M	Sine	*Co-ſine*	Tangent	*Co-Tang.*
0	0.000000	10.000000	0.000000	Infinita.
1	6.463726	9.999999	6.463726	13.536274
2	6.764755	9.999999	6.764756	13.235244
3	6.940847	9.999999	6.940847	13.059153
4	7.065786	9.999999	7.065786	12.934214
5	7.162696	9.999999	7.163696	12.836304
6	7.341877	9.999999	7.241878	12.758122
7	7.308824	9.999999	7.308825	12.691175
8	7.366816	9.999999	7.366817	12.633183
9	7.417968	9.999999	7.417970	12.582030
10	7.463726	9.999998	7.463727	12.536273
11	7.505118	9.999998	7.505120	12.494880
12	7.542906	9 999997	7.542909	12.457091
13	7.577668	9.999997	7.577272	12.422328
14	7.609853	9.999996	7.609857	12.390143
15	7.639816	9.999996	7.639825	12.360180
16	7.667841	9.999995	7.667849	12.332151
17	7.694173	9 999995	7.694179	12.305821
18	7.718977	9.999994	7.719003	12.280997
19	7.742477	9.999993	7.742484	12.257516
20	7.764754	9.999993	7.764761	12.235239
21	7.785943	9.999992	7.785951	12.214049
22	7.806146	9.999991	7.806145	12.193845
23	7.825451	9.999990	7.825460	12.174540
24	7.843934	9.999989	7.843944	12.156056
25	7.861662	9.999989	7.861674	12.138326
26	7.878695	9.999988	7.878708	12.121292
27	7.895085	9.999987	7.895099	12.104901
28	7.910879	9.999986	7.910894	12.089106
29	7.926219	9.999985	7.926134	12.073866
30	7.940842	9.999983	7.940858	12.059142
	Co-ſine	Sine	*Co Tang.*	Tangent

Degree 89.

Degree. o.

Sine	Co-ſine	Tangent	Co Tang.	
7.940842	9.999983	7.940858	12.059142	30
7.955082	9.999982	7.955100	12.044900	29
7.968870	9.999981	7.968889	12.031111	28
7.982233	9.999980	7.982253	12.017747	27
7.995198	9.999978	7.995215	12.004781	26
8.007787	9.999978	7.007810	11.992191	25
8.020021	9.999976	8.020044	11.979956	24
8.031919	9.999975	8.031945	11.968055	23
8.043501	9.999973	8.043527	11.956473	22
8.054781	9.999972	8.054809	11.945181	21
8.065776	9.999971	8.065806	11.934194	20
8.076500	9.999969	8.076531	11.923469	19
8.086965	9.999968	8.086997	11.913003	18
8.097183	9.999966	8.097217	11.902783	17
8.107167	9.999964	8.107203	11.892797	16
8.116926	9.999963	8.116963	11.883037	15
8.126471	9.999961	8.126510	11.873490	14
8.135810	9.999959	8.135851	11.864149	13
8.144953	9.999958	8.144996	11.855004	12
8.153907	9.999956	8.153952	11.846048	11
8.162681	9.999954	8.162737	11.837273	10
8.172180	9.999952	8.171328	11.828672	9
8.179713	9.999950	8.179763	11.820237	8
8.187985	9.999948	8.188036	11.811964	7
8.196102	9.999946	8.196156	11.803844	6
8.204070	9.999944	8.204126	11.795874	5
8.211895	9.999942	8.211953	11.788047	4
8.219581	9.999940	8.219641	11.780359	3
8.227134	9.999938	8.227195	11.772805	2
8.234557	9.999936	8.234621	11.765379	1
8.241855	9.999934	8.241921	11.758079	0
Co-ſine	Sine	*Co.Tang.*	Tangent.	M

Degree 89.

Degree 1.

M	Sine	*Co-ſine*	Tangent	*Co-Tang.*
0	8.241855	9.999934	8.241921	11.758079
1	8.249033	9.999932	8.249102	11.750898
2	8.256094	9.999929	8.256165	11.743835
3	8.263042	9.999927	8.263115	11.736885
4	8.269881	9.999925	8.269956	11.73 044
5	8.276614	9.999922	8.276691	11.723309
6	8.283243	9.999920	8.283323	11.716677
7	8.289773	9.999918	8.289856	11.716144
8	8.296207	9.999915	8.296292	11.703708
9	8.202546	9.999913	8.302634	11.697366
10	8.308794	9.999910	8.308884	11.691116
11	8.314954	9.999907	8.315046	11.684954
12	8.321027	9.999905	8.321122	11.678878
13	8.327016	9.999902	8.327114	11.672886
14	8.332924	9.999899	8.333025	11.666975
15	8.338753	9.999897	8.338856	11.661144
16	8.344504	9.999894	8.344610	11.655390
17	8.350180	9.999891	8.350289	11.649711
18	8.355783	9.999888	8.355895	11.644105
19	8.361315	9.999885	8.361430	11.638570
20	8.366777	9.999882	8.366895	11.633105
21	8.372171	9.999879	8.372292	11.627708
22	8.377499	9.999876	8.377622	11.622378
23	8.382762	9.999873	8.382889	11.617111
24	8.387962	9.999870	8.388092	11.611908
25	8.393101	9.999867	8.393234	11.606766
26	8.398179	9.999864	8.398315	11.601685
27	8.403199	9.999861	8.403338	11.596662
28	8.408161	9.999858	8.408304	11.591696
29	8.413068	9.999854	8.413213	11.586787
30	8.417919	9.999851	8.418068	11.581932
	Co-ſine	Sine	*Co-Tang.*	Tangent

Degree 88.

Degree 1.

Sine	*Co sine*	Tangent	*Co-Tang.*	
8.417919	9.999851	8.418068	11.581932	30
8.422717	9.999848	8.422869	11.577131	29
8.427462	9.999844	8.427618	11.572382	28
8.432156	9.999841	8.432315	11.567685	27
8.436800	9.999838	8.436962	11.563038	26
8.441394	9.999834	8.441560	11.558440	25
8.445941	9.999831	8.446110	11.553990	24
8.450440	9.999827	8.450613	11.549387	23
8.454891	9.999824	8.455070	11.544930	22
8.459301	9.999820	8.459481	11.540519	21
8.463665	9.999816	8.493849	11.556151	20
8.467985	9.999812	8.468172	11.531828	19
8.472263	9.999809	8.472454	11.527546	18
8.476498	9.999805	8.476693	11.523307	17
8.480693	9.999801	8.480892	11.519108	16
8.484843	9.999797	8.485050	11.514950	15
8.488963	9.999794	8.489170	11.510830	14
8.493040	9 999790	8.495250	11.506750	13
8.497078	9.999786	8.497293	11.502707	12
8.501080	9.999782	8.501298	11.498702	11
8.505045	9.999778	8.505267	11.494733	10
8.508974	9.999774	8.509200	11.490800	9
8.512867	9.999769	8.513098	11.486902	8
8.516726	9.999765	8.516951	11.483039	7
8.520551	9.999761	8.520790	11.479210	6
8.524343	9.999756	8.524586	11.475414	5
8.528102	9.999753	8.528349	11.471651	4
8.531828	9.999748	8.532080	11.467920	3
8.535523	9.999744	8.535779	11.464221	2
8.539186	9.999740	8.539117	11.460553	1
8.552819	9.999735	8.543084	11.456910	0
Co-sine	Sine	*Co-Tang.*	Tangent	M

Degree 88.

Degree 2.

M	Sine	*Co-ſine*	Tangent	*Co-Tang.*
0	8.542819	9.999375	8.543084	11.456916
1	8.546422	9.999731	8.546691	11.453309
2	8.549995	9.999725	8.550268	11.449732
3	8.553558	9.999722	8.553817	11.446183
4	8.557054	9.999717	8.557335	11.442664
5	8.560540	9.999713	8.560827	11.439172
6	8.563999	9.999708	8.564291	11.435709
7	8.567431	9.999703	8.567727	11.432272
8	8.570836	9.999699	8.571137	11.428863
9	8.574214	9.999694	8.574520	11.425480
10	8.577566	9.999589	8.577877	11.422123
11	8.580092	9.999685	8.581208	11.418792
12	8.584193	9.999680	8.584514	11.415485
13	8.587469	9.999675	8.587795	11.412205
14	8.590721	9.999670	8.591051	11.408949
15	8.593948	9.999665	8.594283	11.405717
16	8.597152	9.999660	8.597492	11.402508
17	8.600332	9.999655	8.600667	11.399323
18	8.603488	9.999650	8.603838	11.396161
19	8.606622	9.999645	8.606978	11.393022
20	8.609734	9.999640	8.610094	11.389906
21	8.612823	9.999635	8.613189	11.386811
22	8.615891	9.999629	8.616262	11.383738
23	8.618937	9.999624	8.619313	11.380687
24	8.621967	9.999619	8.622343	11.377657
25	8.624965	9.999614	8.625352	11.374648
26	8.627948	9.999608	8.628340	11.371660
27	8.630911	9.999603	8.631308	11.368692
28	8.633854	9.999597	8.634456	11.365744
29	8.636776	9.999592	8.637184	11.362816
30	8.639679	9.999586	8.640093	11.359907
	Co ſine	Sine	*Co-Tang.*	Tangent

Degree 87.

Degree 2.

Sine	Co ſine	Tangent	Co-Tang.	
8.639579	9.999586	8.640093	11.359907	30
8.642563	9.999581	8.642982	11.257017	29
8.645428	9.999575	8.645853	11.354147	28
8.648274	9.999570	8.648704	11.351296	27
8.651102	9.999564	8.651538	11.348463	26
8.653911	9.999558	8.654352	11.345648	25
8.656702	9.999553	8.657149	11.342851	24
8.659475	9.999547	8.659928	11.340072	23
8.662230	9.999541	8.662689	11.337311	22
8.664968	9.999535	8.665433	11.334567	21
8.667689	9.999529	8.668160	11.331840	20
8.670393	9.999523	8.670869	11.329130	19
8.673080	9.999518	8.673563	11.326437	18
8.675751	9.999512	8.676239	11.326761	17
8.678405	9.999506	8.678866	11.321100	16
8.681043	9.999499	8.681544	11.318456	15
8.683665	9.999493	8.684172	11.315828	14
8.686272	9.999487	8.686784	11.313216	13
8.688892	9.999481	8.689381	11.310619	12
8.691438	9.999475	8.691963	11.308037	11
8.693998	9.999469	8.694529	11.305471	10
8.696543	9.999462	8.697081	11.302919	9
8.699073	9.999456	8.699617	11.300383	8
8.701589	9.999450	8.702139	11.297861	7
8.704090	9.999443	8.704646	11.295354	6
8.706576	9.999437	8.707139	11.292860	5
8.709049	9.999431	8.709618	11.290381	4
8.711507	9.999424	8.712083	11.287917	3
8.713952	9.999418	8.714543	11.285466	2
8.716383	9.999411	8.716972	11.283028	1
8.718800	9.999404	8.719396	11.280604	0
Co-ſine	Sine	Co-Tang.	Tangent.	M

Degree 87.

Degree. 3.

M	Sine	*Co-ſine*	Tangent	*Co-Tang.*
0	8.718800	9.999404	8.719396	11.280604
1	8.721204	9.999398	8.721806	11.278194
2	8.723595	9.999391	8.724254	11.275796
3	8.725972	9.999384	8.726588	11.273412
4	8.728336	9.999378	8.728959	11.271041
5	8.730688	9.999371	8.731317	11.268683
6	8.733027	9.999364	8.733663	11.266337
7	8.735354	9.999357	8.735995	11.264004
8	8.737667	9.999350	8.738317	11.261683
9	8.739969	9.999343	8.740626	11.259374
10	8.742259	9.999336	8.742922	11.257078
11	8.744536	9.999329	8.745207	11.254793
12	8.746801	9.999322	8.747479	11.252521
13	8.745955	9.999315	8.749740	11.250240
14	8.751297	9.999308	8.751989	11.248011
15	8.753528	9.999301	8.754227	11.245773
16	8.755747	9.999294	8.756453	11.243547
17	8.757955	9.999286	8.758668	11.241332
18	8.760151	9.999279	8.760872	11.239128
19	8.762337	9.999272	8.763065	11.236935
20	8.764511	9.999265	8.765246	11.234754
21	8.766675	9.999257	8.767417	11.232583
22	8.768828	9.999250	8.769578	11.230422
23	8.770970	9.999242	8.771727	11.228273
24	8.773101	9.999235	8.773866	11.229134
25	8.775223	9.999227	8.775995	11.224005
26	8.777333	9.999220	8.778114	11.221886
27	8.779434	9.999212	8.783222	11.219778
28	8.781524	9.999204	8.782320	11.217680
29	8.783605	9.999197	8.784401	11.215592
30	8.785675	9.999189	8.786486	11.213514
	Co-ſine	Sine	*Co.Tang*	Tang.

Degree 86.

Degree 3.

Sine	*Co ſine*	Tangent	*Co Tang.*	
8.785675	9.999187	8.786486	11.213541	30
8.787736	9.999181	8.788554	11.211446	29
8.789787	9.999174	8.790613	11.209387	28
8.781828	9.999166	8.792662	11.207338	27
8.793859	9.999158	8.794701	11.205299	26
8.795881	9.999150	8.796731	11.203269	25
8.797894	9.999142	8.798752	11.201248	24
8.799897	9.999134	8.800763	11.199237	23
8.801891	9.999126	8.802765	11.197235	22
8.803876	9.999118	8.807458	11.195242	21
8.805852	9.999110	8.806742	11.193253	20
8.807819	9.999102	8.808717	11.191285	19
8.809777	9.999094	8.812683	11.189317	18
8.811726	9.999086	8.812641	11.187359	17
8.813667	9.999077	8.814589	11.185411	16
8.815598	9.999069	8.816529	11.183471	15
8.817522	9.999061	8.818461	11.181539	14
8.819436	9.999052	8.820384	11.179616	13
8.821342	9.999044	8.822298	11.177702	12
8.823240	9.999036	8.824205	11.175795	11
8.825130	9.999027	8.826103	11.173897	10
8.827011	9.999019	8.827992	11.172008	9
8.828884	9.999010	8.829874	11.170126	8
8.830749	9.999002	8.831748	11.168252	7
8.832106	9.998993	8.833513	11.166387	6
8.834456	9.998984	8.835471	11.164529	5
8.836297	9.998976	8.837321	11.162679	4
8.838130	9.998967	8.839163	11.160837	3
8.839956	9.998958	8.840998	11.159002	2
8.841774	9.998940	8.842825	11.157175	1
8.843585	9.998941	8.844644	11.155356	0
Co-ſine	Sine	*Co-Tang.*	Tangent.	M

Degree 86.

Degree 4.

M	Sine	*Co-ſine*	Tangent	*Co-Tang.*
0	8.843584	9.998941	8.844649	11.155356
1	8.845387	9.998931	8.846455	11.153545
2	8.847183	9.998923	8.848240	11.151740
3	8.848971	9.998914	8.850057	11.149943
4	8.850751	9.998905	8.851846	11.148154
5	8.852525	9.998896	8.853628	11.146372
6	8.854291	9.998887	8.855403	11.144597
7	8.856049	9.998878	8.857171	11.142829
8	8.857801	9.998869	8.858922	11.141068
9	8.859546	9.998860	8.860686	11.139314
10	8.861283	9.998851	8.862433	11.137507
11	8.863014	9.998841	8.864173	11.135827
12	8.864738	9.998832	8.865906	11.134094
13	8.866454	9.998823	8.867632	11.132368
14	8.868165	9.998813	8.869351	11.130649
15	8.869868	9.998804	8.871064	11.128936
16	8.871565	9.998795	8.872750	11.127230
17	8.873255	9.998785	8.874469	11.125531
18	8.874938	9.998776	8.876162	11.123838
19	8.876615	9.998766	8.877849	11.122151
20	8.878285	9.998757	8.879529	11.120471
21	8.879949	9.998747	8.881202	11.118798
22	8.881607	9.998738	8.882869	11.117131
23	8.883258	9.998728	8.884530	11.115470
24	8.884903	9.998718	8.886185	11.113815
25	8.886542	9.998708	8.887838	11.112167
26	8.888174	9.998699	8.889476	11.110524
27	8.889801	9.998689	8.891112	11.108888
28	8.891421	9.998679	8.892742	11.107258
29	8.893035	9.998669	8.894 66	11.105634
30	8.894643	9.998659	8.895984	11.104016
	Co-ſine	Sine	*Co Tang.*	Tangent

Degree 85.

Degree 4.

Sine	*Co-ſine.*	Tangent	*Co Tang.*	
8.894643	9.998659	8.895940	11.104016	30
8.896246	9.998649	8.897596	11.102404	29
8.897842	9.998639	8.899202	11.100797	28
8.899432	9.998629	8.900803	11.099197	27
8.901017	9.998619	8.902398	11.097602	26
8.902596	9.998609	8.903987	11.096013	25
8.904169	9.998599	8.905570	11.094430	24
8.905736	9.998589	8.907147	11.093853	23
8.907297	9.998578	8.908719	11.091281	22
8.908853	9.998568	8.910285	11.089715	21
8.910404	6.998558	8.911846	11.088154	20
8.911949	9.998548	8.913401	11.086599	19
8.913488	9.998537	8.914951	11.085049	18
8.915022	9.998527	8.916495	11.083505	17
8.916550	9.998516	8.918034	11.081960	16
8.918073	9.998506	8.919568	11.080432	15
8.919591	9.998495	8.921096	11.078924	14
8.921103	9.998485	8.922619	11.077381	13
8.922610	9.998474	8.924136	11.075864	12
8.924112	9.998464	8.925649	11.074351	11
8.925609	9.998453	8.927156	11.072844	10
8.927100	9.998442	8.928658	11.071344	9
8.928587	9.998431	8.930155	11.069845	8
8.930068	9.998421	8.931647	11.068353	7
8.931544	9.998410	8.933134	11.066866	6
8.933015	9.998309	8.934616	11.065384	5
8.934481	9.998388	8.936093	11.063907	4
8.935942	9.998377	8.937565	11.062435	3
8.937398	9.998365	8.939032	11.060968	2
8.938850	9.998355	8.940494	11.059506	1
8.940295	9.998344	8.941952	11.058048	0
Co-ſine	Sine	*Co-Tang.*	Tangent	M

Degree 85.

Degree 5.

M	Sine	Ca-ſine	Tangent	Co-Tang.
0	8.940296	9.998344	8.941952	11.058048
1	8.941738	9.998333	8.943404	11.056596
2	8.943174	9.998322	8.944852	11.055148
3	8.944606	9.998311	8.946295	11.053705
4	8.946034	9.998300	8.947734	11.052266
5	8.957456	9.998289	8.949168	11.050832
6	8.958814	9.998277	8.950597	11.049403
7	8.950287	9.998256	8.952021	11.047979
8	8.951696	9.998255	8.953441	11.046559
9	8.953099	9.998243	8.954856	1.045144
10	8.954499	9.998232	8.956267	11.043703
11	8.955804	9.998220	8.957674	11.042325
12	8.957284	9.998209	8.959075	11.040925
13	8.958670	9.998197	8.960473	11.039527
14	8.960052	9.998186	8.961856	11.038134
15	8.961429	9.998174	8.963254	11.036746
16	8.962801	9.998163	8.964639	11.035361
17	8.964170	9.998151	8.966019	11.033981
18	8.965534	9.998139	8.967394	11.032606
19	8.966893	9.998128	8.958765	11.031234
20	8.958349	9.998106	8.970133	11.039867
21	8.969600	9.998104	8.971495	11.028505
22	8.970947	9.998092	8.972855	11.027145
23	8.972289	9.998080	8.974209	11.025791
24	8.973626	9.998068	8.975560	11.024440
25	8.974962	9.998056	8.976906	11.023094
26	8.976293	9.998044	8.978248	11.0217 2
27	8.977619	9.998032	8.979586	11.020414
28	8.978941	9.998020	8.980921	11.019079
29	8.980259	9.998008	8.982251	11.017749
30	8.981573	9.997956	8.983577	11.016423
	Co-ſine	Sine	Co Tang.	Tangent

Degree 84.

Degree 5.

Sine	*Co-ſine*	Tangent	*Co Tang.*	
8.981573	9.997996	8.983577	11.010423	30
8.982883	9.997984	8.984899	11.015101	29
8.984189	9.997971	8.986217	11.013783	28
8.985491	9.997959	8.987532	11.012468	27
8.986789	9.997947	8.988842	11.011158	26
8.988083	9.997935	8.990149	11.009851	25
8.989374	9.997922	8.991451	11.008549	24
8.990660	9.997910	8.992750	11.007250	23
8.991943	9.997897	8.994045	11.005955	22
8.993228	9.997885	8.995337	11.004663	21
8.994497	6.997873	8.996624	11.003376	20
8.995763	9.997860	8.997908	11.002092	19
8.997036	9.997847	8.999188	11.000812	18
8.998291	9.997835	9.000455	10.999535	17
8.999550	9.997822	9.001738	10.998262	16
8.900816	9.997809	9.003007	10.996993	15
9.002069	9.997797	9.004272	10.995728	14
9.003318	9.997784	9.005534	10.994466	13
9.004563	9.997771	9.006792	10.993208	12
9.005805	9.997758	9.008047	11.991953	11
9.007044	9.997742	9.009298	10.990702	10
9.008278	9.997732	9.010546	10.989454	9
9.009510	9.997719	9.011790	10.988210	8
9.010737	9.997706	9.013031	10.986969	7
9.011952	9.997693	9.014268	10.985732	6
9.013182	9.997680	9.015502	10.984498	5
9.014399	9.997667	9.016732	10.983268	4
9.015613	9.997654	9.017959	10.982041	3
9.016824	9.997641	9.019183	10.980817	2
9.018031	9.997528	9.020403	10.979597	1
9.019215	9.997614	9.021620	10.978380	0
Co-ſine	Sine	*Co Tang.*	Tangent	M

Degree 84.

Degree. 6.

M	Sine	Co-ſine	Tangent	Co-Tang.
0	9.019235	9.997614	9.021620	10.978380
1	9.020435	9.997601	9.022834	10.977166
2	9.021632	9.997588	9.024044	10.975956
3	9.022825	9.997574	9.025251	10.974749
4	9.024016	9.997562	9.026455	10.973545
5	9.025203	9.997548	9.027655	10.972345
6	9.026306	9.997534	9.028852	10.971148
7	9.027567	9.997520	9.030046	10.969954
8	9.028744	9.997507	9.031237	10.968763
9	9.029918	9.997493	9.032425	10.967575
10	9.031089	9.997480	9.033609	10.966391
11	9.032257	9.997466	9.034791	10.965209
12	9.033421	9.997452	9.035969	10.964031
13	9.034482	9.997439	9.037144	10.962855
14	9.035741	9.997425	9.038316	10.961684
15	9.036896	9.997411	9.039485	10.950505
16	9.038048	9.997397	9.040651	10.959349
17	9 039197	9.997383	9.041813	10.958187
18	9.040342	9.997369	9.042973	10.957027
19	9.041485	9.997355	9.044130	10.955870
20	9.042625	9.997341	9.045284	10.954716
21	9.043762	9.997327	9.046434	10.953566
22	9.044895	9.997313	9.047582	10.952418
23	9.046026	9.997299	9.048727	10 951273
24	9.047154	9.997285	9.049869	10.950131
25	9.048279	9.997271	9.051008	10.959992
26	9.049400	9.997256	9.052144	10.947856
27	9.050519	9.997242	9.053277	10.946723
28	9.051635	9.997228	9.054408	10.945592
29	9.052749	9.997214	9.055535	10.944485
30	9.053859	9.997299	9.056640	10.943340
	Co-ſine	Sine	Co.Tang.	Tang.

Degree 83.

Degree 6.

Sine	Co-ſine	Tangent	Co-Tang.	
9.053859	9.997199	9.056630	10.943340	30
9.054966	9.997185	9.057781	10.942219	29
9.056071	9.997170	9.058900	10.941100	28
9.057172	9.997156	9.060016	10.939984	27
9.058271	9.997141	9.061130	10.938870	26
9.059367	9.997127	9.062240	10.937760	25
9.060460	9.997112	9.063348	10.936652	24
9.061551	9.997098	9.064453	10.935547	23
9.062638	9.997083	9.065556	10.934444	22
9.063723	9.997068	9.066655	10.933345	21
9.064806	9.997053	9.067752	10.932248	20
9.065885	9.997039	9.068847	10.931153	19
9.066962	9.997024	9.069938	10.930062	18
9.068036	9.997009	9.071027	10.928973	17
9.069107	9.996994	9.072113	·10927887	16
9.070176	9.996979	9.073197	10.926803	15
9.071242	9.996964	9.074278	10.925722	14
9.072305	9.996949	9.075356	10.924644	13
9.073366	9.996934	9.076432	10.923568	12
9.074424	9.996919	9.077505	10.922495	11
9.075480	9.996904	9.078575	10.921424	10
9.076533	9.996889	9.079644	10.920356	9
9.077583	9.996874	9.080710	10.919290	8
9.078631	9.996858	9.081773	10.918227	7
9.079676	9.996843	9.082833	10.917167	6
9.080719	9.996828	9.083891	10.916109	5
9.081759	9.996812	9.084947	10.915053	4
9.082797	9.996797	9.085999	10.914000	3
9.083832	9.996782	9.087050	10.912950	2
9.084864	9.996766	9.088098	10.911902	1
9.085894	9.996751	9.089144	10.910856	0
Co ſine	Sine	Co-Tang	Tangent.	M

Degree 83.

Degree 7.

M.	Sine	Co ſine	Tangent	Co-Tang.
0	9.085894	9.996751	9.089144	10.910856
1	9.086922	9.996735	9.090187	10.909813
2	9.087947	9.996720	9.091228	10.908772
5	9.088970	9.996704	9.092266	10.907734
4	9.089990	9.996688	9.093302	10.906698
5	9.091088	9.996673	9.094336	10.905664
6	9.092024	9.996657	9.095367	10.904633
7	9.093037	9.996641	9.096395	10.903604
8	9.094047	9.996625	9.097422	10.902578
9	9.095056	9.996610	9.098446	10.901554
10	9.096 62	9.996594	9.099468	10.900532
11	9.097065	9.996578	9.100487	10.899513
12	9.098066	9.996562	9.101504	10.898496
13	9.099065	9.996546	9.102519	10.897481
14	9.100062	9.996530	9.103532	10.896468
15	9.101056	9.996514	9.104542	10.895458
16	9.102048	9.996498	9.105550	10.894450
17	9.103037	9.996482	9.106556	10.893444
18	9.104025	9.996465	9.107559	10.892441
19	9.105010	9.996449	9.108560	10.891440
20	9.105992	9.996433	9.109559	10.890441
21	9.106973	9.996417	9.110556	10.889444
22	9.107951	9.996400	9.111551	10.888449
23	9.108927	9.996384	9.112543	10.887457
24	9.109901	9.996368	9.113533	10.886467
25	9.100873	9.996351	9.114521	10.885478
26	9.111842	9.996335	9.115507	10.884493
27	9.112809	9.996318	9.116491	10.883509
28	9.113774	9.996302	9.117472	10.882528
29	9.114737	9.996285	9.118452	10.881548
30	9.115698	9.996269	9.119429	10.880571
	Co ſine	Sine	Co-Tang	Tangent

Degree 82.

Degree 7.

Sine	*Co-ſine*	Tangent	*Co-Tang.*	
9.115698	9.996269	9.119427	10.880571	30
9.116656	9.996252	9.120404	10.879595	29
9.117612	9.996235	9.121377	10.878623	28
9.118567	9.996218	9.122348	10.877652	27
9.119519	9.996202	9.123317	10.876683	26
9.120469	9.996185	9.124284	10.875716	25
9.121417	9.996168	9.125248	10.874751	24
9.122362	9.996152	9.126211	10.873789	23
9.123306	9.996134	9.127172	10.872328	22
9.124248	9.996117	9.128130	10.871870	21
9.125187	9.996100	9.129057	10.870913	20
9.126125	9.996083	9.130041	10.869959	19
9.127060	9.996066	9.130994	10.869006	18
9.127993	9.996049	9.131944	10.868056	17
9.128925	9.996032	9.132893	10.867107	16
9.129854	9.996015	9.133839	10.866161	15
9.130781	9.995998	9.134784	10.865216	14
9.131706	9.995980	9.135725	10.864274	13
9.132630	9.995963	9.136666	10.863334	12
9.133551	9.995946	9.137605	10.862395	11
9.134470	9.995923	9.138542	10.861458	10
9.135387	9.995911	9.139476	10.860524	9
9.136303	9.995894	9.140409	10.859591	8
9.137216	9.995876	9.141340	10.858660	7
9.138127	9.995859	9.142269	10.857731	6
9.139037	9.995841	9.143196	10.856804	5
9.139944	9.995825	9.144121	10.855879	4
9.140850	9.995806	9.145044	10.854956	3
9.141754	9.995788	9.145965	10.854035	2
9.142655	9.995770	9.149885	10.853115	1
9.143555	9.995753	9.147803	10.852197	0
Co-ſine	Sine	*Co-Tang.*	Tangent	M

Degree 82.

Degree 8.

M	Sine	*Co-ſine*	Tangent	*Co-Tang.*
0	9.143555	9.9995753	9.147803	10.852197
1	9.144453	9.995735	9.148718	10.851282
2	9.145349	9.995717	9.149632	10.850363
3	9.146243	9.995699	9.159544	10.849456
4	9.147136	9.995681	9.151454	10.848546
5	9.148026	9.995664	9.152363	10.847637
6	9.148915	9.995646	9.153269	10.846731
7	9.149801	9.995620	9.154174	10.845825
8	9.150686	9.995610	9.155077	10.844923
9	9.151569	9.995591	9.155978	10.844022
10	9.152451	9.995573	9.156877	10.843123
11	9.153330	9.995555	9.157775	10.842225
12	9.154208	9.995537	9.158671	10.841329
13	9.155082	9.995519	9.159565	10.840435
14	9.155957	9.995501	9.160457	10.839543
15	9.156830	9.995584	9.161347	10.838633
16	9.157700	9.995464	9.162236	10.837764
17	9.158569	9.995446	9.163123	10.836877
18	9.159436	9.995427	9.164008	10.835992
19	9.160301	9.995409	9.164892	10.835108
20	9.161164	9.995390	9.165773	10.834225
21	9.162052	9.995372	9.166654	10.833346
22	9.162885	9.995353	9.167532	10.832468
23	9.163743	9.995334	9.168409	10.831591
24	9.164600	9.995316	9.169284	10.830716
25	9.165454	9.995297	9.170157	10.829843
26	9.166307	9.995278	9.171029	10.828971
27	9.167158	9.995260	9.171899	10.828101
28	9.168008	9.995241	9.172767	10.827233
29	9.168856	9.995222	9.173634	10.826366
30	9.169702	9.995203	9.174499	10.825501
	Co ſine	Sine	*Co-Tang.*	Tangent

Degree 81.

Degree 8.

M	Sine	*Co-ſine*	Tangent	*Co-Tang.*	
30	9.169702	9.995203	9.174499	10.825501	30
31	9.170546	9.995184	9.175362	10.824638	29
32	9.171389	9.995165	9.176224	10.823776	28
33	9.172230	9.995146	9.177084	10.822916	27
34	9.173070	9.995127	9.177942	10.822057	26
35	9.173908	9.995108	9.178799	10.821201	25
36	9.174744	9.995089	9.179655	10.820345	24
37	9.175578	9.995070	9.180508	10.819492	23
38	9.176411	9.995061	9.181360	10.818940	22
39	9.177242	9.995032	9.182211	10.817789	21
40	9.178072	9.995012	9.183060	10.816940	20
41	9.178900	9.994993	9.183907	10.816093	19
42	9.179726	9.994974	9.184752	10.815248	18
43	9.180551	9.994955	9.185597	10.814403	17
44	9.181374	9.994935	9.186439	10.813561	16
45	9.182195	9.994916	9.187280	10.812720	15
46	9.183016	9.994896	9.188120	10.811880	14
47	9.183834	9.994876	9.188957	10.811042	13
48	9.184651	9.994857	9.189794	10.810206	12
49	9.185466	9.994838	9.190629	10.809371	11
50	9.186280	9.994818	9.191462	10.808538	10
51	9.187192	9.994798	9.192294	10.807706	9
52	9.187903	9.994779	9.193124	10.806876	8
53	9.188712	9.994759	9.193953	10.806047	7
54	9.189519	9.994739	9.194780	10.805220	6
55	9.190325	9.994719	9.195606	10.804394	5
56	9.191130	9.994699	9.196440	10.803569	4
57	9.191933	9.994680	9.197253	10.802747	3
58	9.192734	9.994660	9.198674	10.801926	2
59	9.193534	9.994640	9.198894	10.801106	1
60	9.194332	9.994620	9.199712	10.800287	0
	Co-ſine	Sine	*Co-Tang.*	Tangent	M

Degree 81.

Degree 9.

M	Sine	*Co ſine*	Tangent	*Co-Tang.*
0	9.194332	9.994620	9.199712	10.80 887
1	9.195129	9.994600	9.200529	10.797470
2	9.195925	9.994580	9.201345	10.799955
3	9.196718	9.994560	9.202159	10.797841
4	9.197511	9.994540	9.202971	10.797029
5	9.198302	9.994519	9.203782	10.796218
6	9.199091	9.994499	9.204592	10.795408
7	9.199879	9.994479	9.205400	10.794600
8	9.200566	9.994459	9.206207	10.793793
9	9.201451	9.994438	9.207013	10.792987
10	9.202234	9.994418	9.207817	10.792183
11	9.203017	9.994363	9.208619	10.791381
12	9.203797	9.994377	9.209420	10.790580
13	9.204577	9.994357	9.212220	10.789780
14	9.205354	9.994336	9.211018	10.788982
15	9.206131	9.994316	9.211815	10.788185
16	9.206906	9.994295	9.212611	10.787389
17	9.207679	9.994274	9.213405	10.786595
18	9.208452	9.994254	9.214198	10.785802
19	9.209222	9.974233	9.214989	10.785011
20	9.209992	9.994212	9.215780	10.784220
21	9.210760	9.994191	9.216568	10.783432
22	9.211526	9.994171	9.217356	10.782644
23	9.212291	9.994150	9.218142	10.781858
24	9.213055	9.994129	9.218926	10.781074
25	9.213818	9.994108	9.219710	10.780290
26	9.214579	9.994087	9.220491	10.779508
27	9.215338	9.994066	9.221272	10.778728
28	9.216097	9.994044	9.222052	10.777948
29	9.216854	9.994022	9.222830	10.777170
30	9.217609	9.994003	9.223607	10.766393
	Co ſine	Sine	*Co Tang.*	Tangent

Degree 80.

Degree 9.

Sine	Co-ſine	Tangent	Co-Tang.	
9.217609	9.994003	9.223607	10.776393	30
9.218363	9.993982	9.224382	10.775618	29
9.219116	9.993960	9.225156	10.774844	28
9.219868	9.993939	9.225929	10.774071	27
9.220618	9.993918	9.226704	10.773300	26
9.221367	9.993897	9.227471	10.772529	25
9.222115	9.993875	9.228240	10.771760	24
9.222861	9.993854	9.229007	10.770993	23
9.223606	9.993832	9.229774	10.770226	22
9.224349	9.993811	9.230539	10.769461	21
9.225092	9.993789	9.231302	10.768698	20
9.225833	9.993768	9.232065	10.767935	19
9.226573	9.993746	9.232826	10.767174	18
9.227311	9.993725	9.233586	10.766414	17
9.228048	9.993703	9.234345	10.765655	16
9.228784	9.993681	9.235103	10.764897	15
9.229518	9.993660	9.235859	10.764141	14
9.230252	9.993638	9.236614	10.763386	13
9.230984	9.993616	9.237368	10.762632	12
9.231715	9.993594	9.238120	10.761880	11
9.232444	9.993572	9.238872	10.761128	10
9.233172	9.993550	9.239622	10.760378	9
9.233899	9.993528	9.240371	10.759629	8
9.234625	9.993506	9.241118	10.758882	7
9.235349	9.993484	9.241865	10.758135	6
9.236073	9.993462	9.242610	10.757390	5
9.236795	9.993440	9.243354	10.756646	4
9.237515	9.993418	9.244097	10.755903	3
9.238235	9.993396	9.244839	10.755161	2
9.238952	9.993374	9.245579	10.754421	1
9.239670	9.993351	9.246319	10.753681	0
Co ſine	Sine	Co Tang	Tangent.	M

Degree 80.

Degree 10.

M	Sine	Co-*ſine*	Tangent	*Co-Tang.*
0	9.239670	9.993351	9.246310	10.753681
1	9.240386	9.993329	9.247057	10.752943
2	9.241101	9.993307	9.247794	10.752206
3	9.241814	9.993284	9.248530	10.751470
4	9.242526	9.993262	9.249264	10.750736
5	9.243237	9.993240	9.249998	10.750002
6	9.243947	9.993117	9.250730	10.749270
7	9.244656	9.993195	9.251461	10.748539
8	9.245363	9.993172	9.252191	10.747809
9	9.246070	9.993149	9.252920	10.747080
10	9.245775	9.993127	9.253648	10.745352
11	9.247478	9.993104	9.254374	10.745626
12	9.248181	9.993011	9.2552[illegible]0	10.744900
13	9.248883	9.993059	9.255824	10.744176
14	9.249583	9.993036	9.256547	10.743453
15	9.240282	9.993013	9.257269	10.742731
16	9.250980	9.992990	9.257990	10.742010
17	9.251677	9.992967	9.258710	10.741290
18	9.252373	9.992944	9.259429	10.740571
19	9.253057	9.992921	9.260146	10.749854
20	9.253761	9.992898	9.260863	10.749137
21	9.254453	9.992875	9.261578	10.738422
22	9.255144	9.992852	9.262292	10.737708
23	9.255834	9.992829	9.263005	10.736995
24	9.256523	9.992806	9.263717	10.736283
25	9.257211	9.992783	9.254428	10.735572
26	9.257898	9.992759	9.265138	10.734862
27	9.258583	9.992736	9.255847	10.734153
28	9.259268	9.992613	9.256555	10.733445
29	9.259951	9.992690	9.267261	10.732739
30	9.260633	9.992666	9.267957	10.732033
	Co-ſine	Sine	*Co Tang*	Tangent.

Degree 79.

Degree 10.

Sine	*Co-ſine*	Tangent.	*Co-Tang.*	
9.260633	9.992666	9.267957	10.732033	30
9.261314	9.992643	9.268671	10.731329	29
9.261994	9.992619	9.269375	10.730625	28
9.262573	9.992595	9.270778	10.729923	27
9.263351	9.992572	9.271479	10.729221	26
9.264027	9.992549	9.271470	10.728521	25
9.264703	9.992525	9.272178	10.727822	24
9.265378	9.992501	9.272876	10.727124	23
9.266051	9.992478	9.273573	10.726427	22
9.266723	9.992454	9.974269	10.725731	21
9.267395	9.992430	9.274964	10.725036	20
9.268065	9.992406	9.275658	10.724342	19
9.268734	9.992382	9.276351	10.723649	18
9.269402	9.992362	9.277043	10.722957	17
9.270069	9.992335	9.277734	10.722267	16
9.270735	9.992311	9.278424	10.721567	15
9.271400	9.992287	9.279113	10 720887	14
9.272063	9.992263	9.279801	10.720199	13
9.272726	9.992239	9.280488	10.719512	12
9.273388	9.992214	9.281174	10.718826	11
9.274049	9.992190	9.281858	10.718142	10
9.274708	9.992166	9.282542	10.717458	9
9.275367	9.992142	9.283225	10.716775	8
9.276025	9.992118	9.283907	10.716093	7
9.276681	9.992093	9.284588	10.715412	6
9.277337	9.992069	9.285258	10.714732	5
9.277991	9.992045	9.285946	10.714053	4
9.278645	9.992020	9.286624	10.713376	3
9.279297	9.991995	9.287301	10.712690	2
9.279948	9.991971	9.287977	10.712023	1
9.280599	9.991947	9.288652	10.711348	0
Co-ſine	Sine	*Co-Tang.*	Tangent.	M

Degree 79.

Degree 11.

M	Sine	Co ſine	Tangent	Co-Tang.
0	9.280599	9.991947	9.288652	10.711348
1	9.281229	9.991922	9.289326	10.710674
2	9.281897	9.991897	9.289999	10.710001
3	9.282544	9.991873	9.290671	10.709329
5	9.283190	9.991848	9.291342	10.708658
5	9.283835	9.991823	9.292013	10.707987
6	9.284480	9.991799	9.292682	10.707318
7	9.285121	9.991774	9.293350	10.706650
8	9.285766	9.991749	9.294017	10.705983
9	9.286408	9.991724	9.294684	10.705316
10	9.287048	9.991699	9.295349	10.704651
11	9.287688	9.991674	9.296013	10.703987
12	9.288325	9.991649	9.296677	10.703323
13	9.288964	9.991624	9.297339	10.702661
14	9.289600	9.991599	9.298001	10.701999
15	9.290235	9.991574	9.298662	10.701338
16	9.290870	9.991549	9.299322	10.700678
17	9.291504	9.991521	9.299980	10.700020
18	9.292137	9.991498	9.300638	10.699362
19	9.292768	9.991473	9.301295	10.698105
20	9.293399	9.991448	9.301951	10.698049
21	9.294029	9.991422	9.302607	10.697393
22	9.294658	9.991397	9.303251	10.696739
23	9.295286	9.991372	9.303914	10.696086
24	9.295913	9.991346	9.304567	10.695433
25	9.296539	9.991321	9.305218	10.694782
26	9.297164	9.991295	9.305857	10.694131
27	9.297788	9.991270	9.306519	10.693481
28	9.298412	9.991241	9.307168	10.692832
29	9.299034	9.991218	9.307816	10.692184
30	9.299655	9.991193	9.308463	10.691537
	Co ſine	Sine	Co Tang	Tangent

Degree 78.

Degree 11.

Sine	Co ſine	Tangent	Co Tang.	
9.299655	9.991193	9.308463	10.691537	30
9.300276	9.991167	9.309109	10.690891	29
9.300895	9.991141	9.309754	10.690245	28
9.301514	9.991115	9.310399	10.689601	27
9.302132	9.991090	9.311042	10.688958	26
9.302749	9.991064	9.311685	10.688315	25
9.303364	9.991038	9.312327	10.687673	24
9.303979	9.991012	9.312968	10.687032	23
9.304593	9.990985	9.313608	10.686392	22
9.305207	9.990960	9.314247	10.685753	21
9.305819	9.990934	9.314885	10.685115	20
9.306430	9.990908	9.315523	10.684477	19
9.307041	9.990882	9.316159	10.683841	18
9.307650	9.990855	9.316795	10.683205	17
9.308259	9.990829	9.317430	10.682570	16
9.308867	9.990803	9.318064	10.681936	15
9.309474	9.990777	9.318697	10.681303	14
9.310080	9.990750	9.319330	10.680670	13
9.310685	9.990724	9.319961	10.680039	12
9.311289	9.990697	9.320592	10.679408	11
9.311893	9.990671	9.321222	10.674778	10
9.312495	9.990645	9.321851	10.678149	9
9.313097	9.990618	9.322479	10.677521	8
9.313698	9.990591	9.323106	10.676894	7
9.314297	9.990565	9.323733	10.676267	6
9.314897	9.990538	9.324358	10.675642	5
9.315495	9.990512	9.324983	10.675017	4
9.316092	9.990485	9.325607	10.674393	3
9.316689	9.990458	9.326231	10.673769	2
9.317284	9.990431	9.326853	10.673147	1
9.317879	9.990404	9.327475	10.672525	0
Co ſine	Sine	Co.Tang.	Tangent.	M

Degree 78.

Degree 12.

M	Sine	Co ſine	Tangent	Co-Tang.
0	9.317879	9.990404	9.327475	10.672525
1	9.318473	9.990377	9.328095	10.671905
2	9.319066	9.990351	9.328715	10.671285
3	9.319658	9.950324	9.329334	10.670666
4	9.322250	9.990297	9.329953	10.670047
5	9.320840	9.990270	9.320570	10.669430
6	9.321430	9.950242	9.331187	10.668813
7	9.322019	9.990215	9.331803	10.668197
8	9.322607	9.990188	9.332418	10.667582
9	9.323194	9.990161	9.332033	10.666967
10	9.323786	9.990134	9.333646	10.666354
11	9.324366	9.990107	9.334259	10.665741
12	9.324950	9.990075	9.334871	10.665129
13	9.325534	9.990052	9.335482	10.663907
14	9.326117	9.990025	9.336093	10.663298
15	9.326699	9.989997	9.336702	10.662689
16	9.327281	9.989970	9.337311	10.662081
17	9.327862	9.989942	9.337919	10.661473
18	9.328441	9.989915	9.338527	10.660867
19	9.329020	9.989887	9.339133	10.660261
20	9.329599	9.989860	9.339739	10.659656
21	9.330176	9.989832	9.340344	10.659052
22	9.330753	9.989804	9.340948	10.658448
23	9.331325	9.989777	9.341552	10.657845
24	9.331903	9.989749	9.342155	10.657243
25	9.332478	9.989721	9.342757	10.656642
25	9.333051	9.989693	9.343358	10.656042
27	9.333624	9.989665	9.343958	10.655442
28	9.334195	9.989657	9.344558	10.654843
29	9.334766	9.989609	9.345157	10.654245
30	9.335337	9.989581	9.345755	10.654245
	Co-ſine	Sine	Co Tang	Tangent.

Degree 77.

Degree 12.

Sine	Co-ſine	Tangent	Co.Tang.	
9.335337	9.989581	9.345755	10.654245	30
9.335906	9.989553	9.346353	10.653647	29
9.336475	9.989525	9.346949	10.653051	28
9.337043	9.989597	9.347545	10.652455	27
9.337610	9.989469	9.348141	10.651859	26
9.338176	9.989441	9.343735	10.651265	25
9.338742	9.989413	9.349329	10.650671	24
9.339305	9.989384	9.349922	10.650078	23
9.339870	9.989356	9.350514	10.649486	22
9.340434	9.989328	9.351106	10.648894	21
9.340996	9.989299	9.351697	10.648303	20
9.341558	9.989271	9.352257	10.647713	19
9.342119	9.989243	9.352876	10.647124	18
9.342679	9.989214	9.353465	10.646535	17
9.343229	9.989185	9.354053	10.645947	16
9.343797	9.989157	9.354644	10.645360	15
9.344355	9.989128	9.355227	10.644773	14
9. 44912	9.989100	9.355812	10.644187	13
9.345469	9.989071	9.356398	10.643602	12
9.346024	9.989042	9.356982	10.643018	11
9.346579	9.989014	9.357566	10.642434	10
9.347134	9.988985	9.358149	10.641851	9
9.347687	9.988956	9.358731	10.641269	8
9.348240	9.988927	9.359313	10.640687	7
9.348792	9.988898	9.359893	10.640107	6
9.349343	9.988869	9.360474	10.639525	5
9.349893	9.988840	9.361053	10.638947	4
9.350443	9.988811	9.361632	10.638369	3
9.350992	9.988782	9.362210	10.637790	2
9.351540	9.988754	9.362787	10.637213	1
9.352088	9.988724	9.363364	10.636635	0
Co ſine	Sine	Co.Tang.	Tangent.	M

Degree 77.

Degree 13.

M	Sine	*Co ſine*	Tangent	*Co-Tang.*
0	9.352088	9.988724	9.363364	10.636636
1	9.352635	9.988695	9.363940	10.636060
2	9.353181	9.988666	9.364515	10.635485
3	9.353726	9.988636	9.365090	10.634910
4	9.354271	9.988607	9.365664	10.634336
5	9.354185	9.988578	9.366237	10.633763
6	9.355358	9.988548	9.366810	10.633190
7	9.355901	9.988519	9.367382	10.632618
8	9.356443	9.988489	9.367953	10.632047
9	9.356984	9.988460	9.368524	10.631476
10	9.357524	9.988430	9.369094	10.630906
11	9.358064	9.988401	9.369663	10.630337
12	9.358603	9.988371	9.370232	10.629768
13	9.359141	9.988341	9.370799	10.629201
14	9.359679	9.988312	9.371367	10.628633
15	9.350215	9.988282	9.371933	10.628067
16	9.360752	9.988252	9.372499	10.627501
17	9.361287	9.988223	9.373054	10.626935
18	9.361822	9.988193	9.373629	10.626371
19	9.362356	9.988163	9.374193	10.625807
20	9.362889	9.988133	9.374756	10.625244
21	9.363422	9.988103	9.375319	10.624681
22	9.363954	9.988073	9.375881	10.624119
23	9.364485	9.988043	9.376442	10.623558
24	9.355016	9.988013	9.377003	10.622997
25	9.365546	9.987983	9.377562	10.622437
26	9.366075	9.987953	9.378122	10.621878
27	9.366604	9.987922	9.378681	10.621319
28	9.367132	9.987892	9.379239	10.620761
29	9.367659	9.987862	9.379797	10.620203
30	9.368185	9.987882	9.380354	10.619646
	Co-ſine	Sine	*Co Tang*	Tangent.

Degree 76.

Degree 13.

Sine	Co ſine	Tangent.	Co-Tang.	
9.368185	9.987832	9.380354	10.619646	30
9.368711	9.987801	9.380910	10.619090	29
9.369236	9.987771	9.381466	10.618534	28
9.369761	9.987740	9.382021	10.617980	27
9.370285	9.987710	9.382575	10.617425	26
9.370808	9.987679	9.383129	10.616871	25
9.371330	9.987649	9.383682	10.616318	24
9.371852	9.987618	9.384234	10.615766	23
9.372373	9.987588	9.384786	10.615214	22
9.372894	9.987557	9.385337	10.614663	21
9.373414	9.987526	9.385888	10.614112	20
9.373933	9.987495	9.386438	10.613562	19
9.374452	9.987465	9.386987	10.613013	18
9.374970	9.987434	9.387536	10.612464	17
9.375487	9.987403	9.388084	10.611916	16
9.376003	9.987372	9.388631	10.611369	15
9.376519	9.987341	9.389178	10.610822	14
9.377035	9.987310	9.389724	10.610276	13
9.377549	9.987279	9.390270	10.609730	12
9.378063	9.987248	9.390815	10.609185	11
9.378577	9.987217	9.391360	10.608640	10
9.379089	9.987186	9.391907	10.608097	9
9.379601	9.987155	9.392447	10.607553	8
9.380113	9.987124	9.392989	10.607011	7
9.380624	9.987092	9.393531	10.606469	6
9.381134	9.987061	9.394074	10.605927	5
9.381643	9.987030	9.394614	10.605386	4
9.382152	9.986998	9.395154	10.604846	3
9.382661	9.986967	9.395694	10.604306	2
9.383168	9.986936	9.396233	10.603767	1
9.383675	9.986904	9.396771	10.603229	0
Co ſine	Sine	Co-Tang.	Tangent.	M

Degree 76.

Degree 14.

M	Sine	*Co ſine*	Tangent	*Co-Tang.*
0	9.383675	9.986904	9.396771	10.603229
1	9.384181	9.986873	9.397309	10.602691
2	9.384687	9.986841	9.397846	10.602154
5	9.385192	9.986809	9.399383	10.601617
4	9.385697	9.986778	9.398919	10.601081
5	9.386201	9.986746	9.399455	10.600545
6	9.386704	9.986714	9.399990	10.600010
7	9.387207	9.986683	9.400524	10.599476
8	9.387709	9.986651	9.401058	10.598942
9	9.388210	9.986619	9.401591	10.598409
10	9.388711	9.986587	9.402124	10.597876
11	9.389211	9.986555	9.402656	10.597344
12	9.389711	9.986523	9.403187	10.596813
13	9.390210	9.986491	9.403718	10.596282
14	9.390708	9.986459	9.404249	10.595751
15	9.391206	9.986427	9.404778	10.595222
16	9.391703	9.986395	9.405306	10.594693
17	9.392199	9.986363	9.405836	10.594164
18	9.392695	9.986338	9.406364	10.593636
19	9.393190	9.986299	9.406892	10.593608
20	9.393685	9.986266	9.407419	10.592581
21	9.394179	9.986234	9.407945	10.592055
22	9.394673	9.986201	9.408471	10.591529
23	9.395166	9.986169	9.408995	10.591001
24	9.395654	9.986137	9.409521	10.590479
25	9.396150	9.986124	9.410045	10.589954
26	9.396641	9.986072	9.410569	10.582431
27	9.397131	9.986039	9.411092	10.588908
28	9.397621	9.986007	9.411615	10.588385
29	9.398111	9.985974	9.412137	10.587863
30	9.398600	9.985942	9.412658	10.587342
	Co ſine	Sine	*Co Tang*	Tangent

Degree 75.

Degree 14.

Sine	Co-ſine	Tangent	Co-Tang.	
9.398600	9.985942	9.412658	10.587342	30
9.399087	9.985909	9.413179	10.586821	29
9.399575	9.985876	9.413699	10.586301	28
9.400062	9.985843	9.414219	10.585781	27
9.400549	9.985811	9.414738	10.585262	26
9.401035	9.985778	9.415257	10.585742	25
9.401520	9.985745	9.415775	10.584225	24
9.402005	9.985712	9.416293	10.583707	23
9.402489	9.985679	9.416810	10.583190	22
9.402972	9.985646	9.417326	10.582674	21
9.403455	9.985613	9.417842	10.582157	20
9.403938	9.985580	9.418357	10.581642	19
9.404420	9.985547	9.418873	10.581127	18
9.404901	9.985513	9.419387	10.580613	17
9.405382	9.985480	9.419901	10.580099	16
9.405862	9.985447	9.420415	10.589585	15
9.406341	9.985414	9.420927	10.579072	14
9.406820	9.985380	9.421440	10.578560	13
9.407299	9.985347	9.421951	10.578048	12
9.407776	9.985314	9.422463	10.577537	11
9.408254	9.985280	9.422973	10.577026	10
9.408731	9.985247	9.423484	10.576516	9
9.409207	9.985213	9.423993	10.576007	8
9.409682	9.985180	9.424503	10.575497	7
9.410157	9.985146	6.425011	10.574989	6
9.410632	9.985112	9.425518	10.574480	5
9.411106	9.985079	9.426027	10.573973	4
9.411579	9.985045	9.426534	10.573466	3
9.412052	9.985011	9.427041	10.572959	2
9.412524	9.984977	9.427547	10.572453	1
9.412996	9.984943	9.428052	10.571947	0
Co ſine	Sine	Co Tang	Tangent.	M

Degree 75.

Degree 15.

M	Sine	*Co ſine*	Tangent	*Co-Tang.*
0	9.412996	9.984944	9.428052	10.571947
1	9.413467	9.984910	9.428557	10.571442
2	9.413938	9.984876	9.429057	10.570938
3	9.414408	9.984842	9.429566	10.570434
4	9.414878	9.984808	9.430070	10.569930
5	9.415347	9.984774	9.430573	10.569427
6	9.415815	9.984740	9.431075	10.568925
7	9.416283	9.984706	9.431577	10.568423
8	9.416850	9.984672	9.432079	10.567921
9	9.417217	9.984637	9.432580	10.567420
10	9.417684	9.984603	9.433080	10.566920
11	9.418149	9.984569	9.433580	10.566419
12	9.418615	9.984535	9.434080	10.565920
13	9.419079	9.984500	9.434579	10.565421
14	9.419544	9.984466	9.435075	10.564922
15	9.420007	9.984431	9.435576	10.564424
16	9.420470	9.984397	9.436073	10.563927
17	9.420933	9.984363	9.436570	10.563430
18	9.421395	9.984328	9.437067	10.562933
19	9.421856	9.984293	9.437563	10.562437
20	9.422317	9.984259	9.438059	10.561941
21	9.422778	9.984224	9.438554	10.561446
22	9.423238	9.984189	9.439048	10.560952
23	9.423697	9.984155	9.439543	10.560457
24	9.424156	9.984120	9.440036	10.559964
25	9.424615	9.984085	9.440529	10.559471
26	9.425072	9.984050	9.441022	10.558978
27	9.425530	9.984015	9.441514	10.558485
28	9.425987	9.983980	9.442006	10.557994
29	9.426443	9.983945	9.442497	10.557503
30	9.426899	9.983910	9.442983	10.557911
	Co ſine	Sine	*Co-Tang.*	Tangent

Degree 74.

Degree 15.

Sine	Co-ſine	Tangent	Co-Tang.	
9.416899	9.983910	9.442988	10.557011	30
9.427354	9.983875	9.443479	10.556521	29
9.427809	9.983840	9.443958	10.556031	28
9.428264	9.983805	9.444458	10.555542	27
9.428717	9.983770	9.444947	10.555053	26
9.429170	9.983735	9.445435	10.554565	25
9.439623	9.983699	9.445923	10.554077	24
9.430075	9.983664	9.446411	10.553589	23
9.430507	9.983629	9.446898	10.553102	22
9.430978	9.983593	9.447384	10.552616	21
9.431429	9.983558	9.447870	10.552129	20
9.431879	9.983523	9.448356	10.551644	19
9.432328	9.983487	9.448841	10.551159	18
9.432778	9.983451	9.449325	10.550674	17
9.433206	9.983416	9.449870	10.550181	16
9.433674	9.983380	9.440294	10.549706	15
9.434122	9.983345	9.450777	10.549223	14
9.434569	9.983309	9.451260	10.548740	13
9.435016	9.983273	9.451743	10.548257	12
9.435462	9.983238	9.452225	10.547775	11
9.435918	9.983202	9.452706	10.547295	10
9.436353	9.983166	9.453187	10.546813	9
9.436798	9.983130	9.453668	10.546332	8
9.437242	9.983094	9.454148	10.545852	7
9.437586	9.983058	6.454629	10.545372	6
9.438129	9.983022	9.455107	10.544893	5
9.438572	9.982986	9.455586	10.544414	4
9.439014	9.982950	9.456064	10.543936	3
9.439456	9.982914	9.456542	10.543458	2
9.439897	9.982878	9.457019	10.542980	1
9.430338	9.982842	9.457496	10.542503	0
Co ſine	Sine	Co Tang	Tangent.	M

Degree 74.

Degree 16.

M	Sine	Co ſine	Tangent	Co-Tang.
0	9.440338	9.982842	9.457496	10.542503
1	9.440778	9.982805	9.457973	10.542027
2	9.441218	9.982769	9.458449	10.541551
3	9.441658	9.982733	9.458925	10.541075
4	9.442096	9.982696	9.459400	10.540600
5	9.442535	9.982660	9.459875	10.540125
6	9.442972	9.982623	9.460349	10.539651
7	9.443416	9.982587	9.460829	10.539177
8	9.443848	9.982550	9.461297	10.538703
9	9.444284	9.982514	9.461770	10.538230
10	9.444720	9.982477	9.462242	10.537758
11	9.445155	9.982441	9.462714	10.537285
12	9.445590	9.982404	9.463186	10.536814
13	9.446025	9.982367	9.463658	10.536342
14	9.446459	9.982330	9.464129	10.535871
15	9.446893	9.982294	9.464599	10.535401
16	9.447326	9.982257	9.465069	10.534931
17	9.447759	9.982220	9.465539	10.534461
18	9.448191	9.982183	9.46600[illegible]	10.533992
19	9.448623	9.982146	9.456476	10.533523
20	9.449054	9.982109	9.466945	10.533055
21	9.449485	9.982072	9.467413	10.532587
22	9.449915	9.982035	9.467880	10.532120
23	9.450345	9.981998	9.468347	10.531653
24	9.450775	9.981961	9.468814	10.531186
25	9.451203	9.981923	9.469280	10.530720
26	9.451632	9.981886	9.469746	10.53[illegible]254
27	9.452060	9.981849	9.470211	10.529789
28	9.452488	9.981812	9.470676	10.529324
29	9.452915	9.981774	9.471141	10.528859
30	9.453342	9.981737	9.471605	10.528395
	Co-ſine	Siue	Co-Tang	Tangent

Degree 73.

Degree 16.

Sine	Co ſine	Tangent	Co-Tang.	
9.453342	9.981737	9.471605	10.528395	30
9.453768	9.981699	9.472068	10.527931	29
9.454194	9.981662	9.472532	10.527468	28
9.454619	9.981624	9.472995	10.527005	27
9.455044	9.981587	9.473457	10.526543	26
9.455469	9.981549	9.473919	10.526081	25
9.455892	9.981512	9.474381	10.525619	24
9.456316	9.981474	9.474842	10.525158	23
9.456739	9.981436	9.475303	10.524695	22
9.457162	9.981398	9.475763	10.524237	21
9.457584	9.981361	9.476223	10.523777	20
9.458006	9.981323	9.476683	10.523317	19
9.458427	9.981285	9.477142	10.522858	18
9.458848	9.981247	9.477601	10.522399	17
9.459268	9.981209	9.478059	10.521941	16
9.459684	9.981171	9.478517	10.521483	15
9.460108	9.981133	9.478975	10.521025	14
9.460527	9.981095	9.479432	10.520568	13
9.460946	9.981057	9.479889	10.520111	12
9.461364	9.981019	9.480345	10.519655	11
9.461782	9.980980	9.480801	10.519199	10
9.462199	9.980942	9.481257	10.518743	9
9.462616	9.980904	9.481712	10.518288	8
9.463032	9.980866	9.482167	10.517833	7
9.463448	9.980827	9.482621	10.517379	6
9.463864	9.980789	9.483075	10.516925	5
9.464279	9.980750	9.483528	10.516471	4
9.464694	9.980712	9.483982	10.516018	3
9.465108	9.980672	9.484434	10.515565	2
9.465522	9.980635	9.484887	10.515113	1
9.465953	9.980596	9.485339	10.514661	0
Co-ſine	Sine	Co-Tang.	Tangent.	M

Degree 73.

Degree 17.

M	Sine	Co ſine	Tangent	Co-Tang.
0	9.465935	9.980596	9.485339	10.514661
1	9.466348	9.980558	9.485791	10.514209
2	9.466761	9.980519	9.486242	10.513758
3	9.467173	9.980480	9.486693	10.513307
4	9.467585	9.980441	9.487143	10.512857
5	9.467996	9.980403	9.487593	10.512407
6	9.468407	9.980364	9.488043	10.511957
7	9.468817	9.980325	9.488493	10.511507
8	9.469227	9.980286	9.488941	10.511059
9	9.469637	9.980247	9.489390	10.510610
10	9.460446	9.980208	9.489838	10.510162
11	9.470455	9.980169	9.490286	10.509714
12	9.471863	9.980130	9.490733	10.509267
13	9.471071	9.980091	9.491180	10.508820
14	9.471678	9.980052	9.491627	10.508373
15	9.472086	9.980012	9.492073	10.5 7928
16	9.472492	9.979973	9.492519	10.507481
17	9.472898	9.979934	9.492964	10.507035
18	9.473304	9.979894	9.493410	10.506590
19	9.473710	9.979855	9.493854	10.506145
20	9.474115	9.979816	9.494299	10.505701
21	9.474519	9.979776	9.494743	10.505257
22	9.474923	9.979737	9.495186	10.504813
23	9.475327	9.979697	9.495630	10.504370
24	9.475730	9.979658	9.496073	10.503928
25	9.476133	9.979618	9.496515	10.503485
26	9.476536	9.979578	9.496957	10.503043
27	9.476938	9.979539	9.497399	10.502601
28	9.477340	9.979499	9.497840	10.502160
29	9.477741	9.979459	9.498282	10.501718
30	9.478142	9.979419	9.498722	10.501278
	Co-ſine	Siue	Co-Tang	Tangent.

Degree 72.

Degree 17.

Sine	Co ſine	Tangent	Co Tang.	
9.478142	9.979419	9.498722	10.501278	30
9.478542	9.979380	9.499163	10.500837	29
9.478942	9.979340	9.499602	10.500398	28
9.479342	9.979300	9.500042	10.499958	27
9.479741	9.979260	9.500481	10.499519	26
9.480140	9.979220	9.500920	10.499080	25
9.480538	9.979180	9.501359	10.498641	24
9.480936	9.979140	9.501797	10.498203	23
9.481334	9.979099	9.502234	10.497765	22
9.481731	9.979059	9.502672	10.497328	21
9.482123	9.979019	9.503107	10.496891	20
9.482525	9.978980	9.503546	10.496454	19
9.482921	9.978939	9.503982	10.496018	18
9.483316	9.978898	9.504418	10.495582	17
9.483711	9.978858	9.504854	10.495146	16
9.484106	9.978817	9.505289	10.494711	15
9.484501	9.978777	9.505724	10.494216	14
9.484895	9.978736	9.506158	10.493841	13
9.485289	9.978696	9.506593	10.493407	12
9.485682	9.978655	9.507026	10.492973	11
9.486075	9.978615	9.507459	10.492540	10
9.486467	9.978574	9.507892	10.491107	9
9.486859	9.978533	9.508326	10.491674	8
9.487251	9.978493	9.508759	10.491241	7
9.487642	9.978452	9.509181	10.490809	6
9.488033	9.978411	9.509622	10.490377	5
9.488424	9.978370	9.510044	10.489946	4
9.488814	9.978329	9.510480	10.489515	3
9.489204	9.978283	9.510916	10.489084	2
9.489593	9.978247	9.511346	10.488654	1
9.489982	9.978206	9.511776	10.488225	0
Co-ſine	Sine	Co-Tang.	Tangent.	M

Degree 72.

Degree 18.

M	Sine	Co-ſine	Tangent	Co-Tang.	
0	9.489982	9.978205	9.511776	10.488224	6
1	9.490371	9.978165	9.512206	10.487794	5
2	9.490759	9.978124	9.512635	10.487265	5
3	9.491147	9.978083	9.513064	10.486936	5
4	9.491534	9.978042	9.513493	10.486507	5
5	9.491922	9.978000	9.513921	10.486079	5
6	9.492308	9.977956	9.514349	10.485651	5
7	9.492695	9.977918	9.514777	10.485223	5
8	9.493080	9.977877	9.515204	10.484795	5
9	9.493466	9.977835	9.515631	10.484369	5
10	9.493851	9.977794	9.516057	10.483942	5
11	9.494236	9.977752	9.516484	10.483516	4
12	9.494620	9.977711	9.516910	10.483090	4
13	9.495005	9.977669	9.517335	10.482665	4
14	9.495388	9.977628	9.517761	10.482239	4
15	9.495771	9.977586	9.518185	10.481814	4
16	9.496154	9.977544	9.518610	10.481390	4
17	9.496537	9.977503	9.519034	10.480966	4
18	9.496919	9.977461	9.519458	10.480542	4
19	9.497301	9.977419	9.519882	10.480118	4
20	9.497682	9.977377	9.520305	10.479695	4
21	9.498053	9.977335	9.520728	10.479272	3
22	9.498444	9.977293	9.521151	10.478849	3
23	9.498824	9.977251	9.521573	10.478427	3
24	9.499204	9.977209	9.521995	10.478005	3
25	9.499584	9.977167	9.522417	10.477583	3
26	9.499963	9.977125	9.522838	10.477162	3
27	9.500342	9.977083	9.523259	10.476741	3
28	9.500720	9.977041	9.523679	10.476320	3
29	9.501099	9.976999	9.524109	10.475900	3
30	9.501476	9.976956	9.524520	10.475480	3
	Co ſine	Sine	Co-Tang	Tangent	M

Degree 71.

Degree 18.

Sine	Co-ſine	Tangent.	Co-Tang.	
9.501476	9.977956	9.524520	10.475080	30
9.501854	9.976914	9.524939	10.475060	29
9.502231	9.976872	9.525359	10.474641	28
9.502607	9.976830	9.525778	10.474222	27
9.502984	9.976787	9.526197	10.473803	26
9.503360	9.976745	9.526615	10.473385	25
9.503735	9.976702	9.527033	10.472967	24
9.504110	9.976660	9.527451	10.472549	23
9.504485	9.976617	9.527868	10.472132	22
9.504840	9.976574	9.528285	10.471715	21
9.505234	9.976532	9.528702	10.471298	20
9.505608	9.976489	9.529118	10.470881	19
9.505981	9.976446	9.529535	10.470465	18
9.506354	9.976404	9.529950	10.470049	17
9.506727	9.976361	9.530366	10.469634	16
9.507099	9.976318	9.530781	10.469219	15
9.507471	9.976275	9.531169	10.468804	14
9.507843	9.976232	9.531611	10.468389	13
9.508214	9.976185	9.532025	10.467975	12
9.508585	9.976146	9.532436	10.467561	11
9.508955	9.976103	9.532852	10.467147	10
9.509326	9.976060	9.533266	10.466784	9
9.509696	9.976017	9.533679	10.466321	8
9.510065	9.975973	9.534092	10.465908	7
9.510434	9.975930	9.534504	10.465496	6
9.510802	9.975887	9.534916	10.465084	5
9.511171	9.975814	9.535328	10.464672	4
9.511540	9.975800	9.535739	10.464261	3
9.511907	9.975757	9.536150	10.463849	2
9.512275	9.975713	9.536561	10.463439	1
9.512642	9.975670	9.536972	10.463028	0
Co-ſine	Sine	Co-Tang.	Tangent.	M

Degree 71.

Degree 19.

M	Sine	Co-ſine	Tangent	Co-Tang.
0	9.512642	9.975670	9.536972	10.463028
1	9.513009	9.975626	9.537382	10.462618
2	9.513375	9.975583	9.537792	10.462208
5	9.513741	9.975539	9.538202	10.461798
4	9.514107	9.975496	9.538610	10.461389
5	9.514472	9.975452	9.539020	10.460980
6	9.514837	9.975408	9.539429	10.460571
7	9.515202	9.975364	9.539837	10.460163
8	9.515566	9.975321	9.540245	10.459755
9	9.515930	9.975277	9.540653	10.459347
10	9.516294	9.975233	9.541061	10.458939
11	9.516657	9.975185	9.541468	10.458532
12	9.517020	9.975145	9.541875	10.458125
13	9.517382	9.975101	9.542281	10.457719
14	9.517745	9.975057	9.542688	10.457312
15	9.518107	9.975013	9.543094	10.456905
16	9.518468	9.974969	9.543499	10.456501
17	9.518829	9.974925	9.543905	10.456095
18	9.519190	9.974880	9.544310	10.455690
19	9.519551	9.974836	9.544715	10.455285
20	9.519911	9.974792	9.545119	10.454881
21	9.520271	9.974747	9.545524	10.454476
22	9.520631	9.974703	9.545927	10.454072
23	9.520990	9.974659	9.546331	10.453669
24	9.521349	9.974614	9.546735	10.453265
25	9.521707	9.974570	9.547138	10.452862
26	9.522065	9.974525	9.547540	10.452459
27	9.522423	9.974480	9.547943	10.452057
28	9.522781	9.974436	9.548345	10.451655
29	9.523138	9.974391	9.548747	10.451253
30	9.523495	9.974340	9.549149	10.450851
	Co ſine	Sine	Co-Tang	Tangent

Degree 70. .

. Degree 19.

Sine	*Co-ſine*	Tangent	*Co-Tang.*	—
9.523495	9.974346	9.549149	10.450851	30
9.523851	9.974302	9.549550	10.450450	29
9.524208	9.974257	9.549951	10.450049	28
9.524564	9.974212	9.550352	10.449648	27
9.524920	9.974167	9.550752	10.449048	26
9.525275	9.974122	9.551152	10.448848	25
9.525630	9.974077	9.551552	10.448448	24
9.525984	9.974032	9.551952	10.448048	23
9.526339	9.973987	9.552351	10.447649	22
9.525693	9.973942	9.552750	10.447250	21
9.527046	9.973897	9.553149	10.446851	20
9.527400	9.973852	9.553548	10.446452	19
9.527753	9 973807	9.553946	10.446054	18
9.528105	9.973761	9.554344	10.445656	17
9.528458	9.973716	9.554741	10.445259	16
9.528810	9.973671	9.555139	10.444861	15
9.529161	9.973625	9.555536	10.444464	14
9.529513	9 973580	9.555932	10.444068	13
9.529864	9.973535	9.556329	10.443671	12
9.530214	9.973489	9.556725	10.443257	11
9.530565	9.973443	9.557121	10.442876	10
9.530915	9.973398	9.557517	10.442483	9
9.531265	9.973352	9.557912	10.442088	8
9.531614	9.973307	9.558308	10.441693	7
9.531963	9.973261	9.558702	10.441298	6
9.532312	9.973215	9.559097	10.440903	5
9.532661	9.973169	9.559491	10.440509	4
9.533099	9.973123	9.559885	10.440115	3
9.533357	9.973078	9.560279	10.439721	2
9.533704	9.973032	9.560673	10.439327	1
9.534052	9.973985	9.561066	10.438934	0
Co-ſine	Sine	*Co-Tang.*	Tangent	M

Degree 70.

Degree 20.

M	Sine	*Co-ſine*	Tangent	*Co-Tang.*
0	9.534052	9.972986	9.561066	10.438934
1	9.534399	9.972940	9.561459	10.438541
2	9.534746	9.972894	9.561851	10.438148
3	9.535091	9.972848	9.562244	10.437756
4	9.535437	9.972801	9.552536	10.437364
5	9.535782	9.972755	9.563028	10.436972
6	9.536129	9.972709	9.563419	10.436580
7	9.536474	9.972663	9.563811	10.436189
8	9.536818	9.972617	9.564202	10.435798
9	9.537163	9.972570	9.564592	10.435407
10	9.537507	9.972524	9.564983	10.435017
11	9.537851	9.972477	9.565373	10.434627
12	9.538194	9.972431	9.565763	10.434237
13	9.538537	9.972384	9.566153	10.433847
14	9.538880	9.972338	9.566542	10.433457
15	9.539222	9.972291	9.566932	10.433068
16	9.539566	9.972245	9.567320	10.432679
17	9.539907	9.972198	9.567709	10.432291
18	9.540249	9.972151	9.568097	10.431902
19	9.540590	9.972105	9.568486	10.431514
20	9.540931	9.972058	9.569873	10.431126
21	9.541272	9.972011	9.569261	10.430739
22	9.541612	9.971964	9.569648	10.430351
23	9.541953	9.971917	9.560035	10.429964
24	9.542292	9.971870	9.560402	10.429578
25	9.542632	9.971823	9.560809	10.429191
26	9.542971	9.971776	9.571195	10.428805
27	9.543310	9.971729	9.571581	10.428419
28	9.543649	9.971682	9.571967	10.428033
29	9.543987	9.971635	9.572352	10.427643
30	9.544325	9.971588	9.572738	10.427262
	Co-ſine	Sine	*Co-Tang.*	Tangent

Degree 69.

Degree. 20.

M	Sine	Co-ſine	Tangent	Co Tang.	
30	9.544325	9.971588	9.572738	10.427262	30
31	9.544663	9.971540	9.573123	10.426877	29
32	9.545000	9.971492	9.573507	10.426492	28
33	9.545338	9.971446	9.573892	10.426108	27
34	9.545674	9.971398	95.74276	10.425724	26
35	9.546011	9.971351	9.574660	10.425340	25
36	9.546347	9.971303	9.575044	10.424956	24
37	9.546583	9.971256	9.575427	10.424573	23
38	9.547019	9.971208	9.575810	10.424189	22
39	9.547354	9.971161	9.576193	10.423807	21
40	9.547689	9.971112	9.576575	10.423424	20
41	9.548024	9.971065	9.576958	10.423041	19
42	9.548358	9.971018	9.577341	10.422659	18
43	9.548593	9.970970	9.577723	10.422277	17
44	9.549026	9.970923	9.578104	10.421896	16
45	9.549360	9.970874	9.578486	10.421514	15
46	9.549693	9.970826	9.578867	10.421133	14
47	9 550026	9.970779	9.579248	10.420752	13
48	9.550359	9.970731	9.579628	10.420371	12
49	9.550692	9.970683	9.580009	10.419991	11
50	9.551024	9.970634	9.580389	10.419511	10
51	9.551355	9.970586	9.580769	10.419231	9
52	9.551687	9.970538	9.581149	10.418851	8
53	9.552018	9.970490	9.581528	10 418472	7
54	9.552349	9.970442	9.581907	10.418092	6
55	9.552680	9.970394	9.582286	10.417713	5
56	9.553010	9.970345	9.582665	10.417335	4
57	9.553340	9.970297	9.583043	10.416956	3
58	9.553670	9.970249	9.583422	10.416578	2
59	9.554000	9.970200	9.583800	10.416200	1
60	9.554329	9.970152	9.584177	10.415823	0
	Co-ſine	Sine	Co.Tang.	Tangent	M

Degree 69.

Degree. 21.

M	Sine	*Co fine*	Tangent	*Co Tang.*	
0	9.554329	9.970155	9.584177	10.415822	60
1	9.554658	9.970105	9.584555	10.415445	59
2	9.554987	9.970055	9.584932	10.415068	58
3	9.555315	9.970006	9.585308	10.414691	57
4	9.555643	9.969957	9.585685	10.414314	56
5	9.555971	9.969909	9.586062	10.413938	55
6	9.556299	9.969860	9.586439	10.413561	54
7	9.556625	9.969811	9.586815	10.413185	53
8	9.556953	9.969762	9.587190	10.412800	52
9	9.557279	9.969715	9.587566	10.412434	51
10	9.557606	9.969565	9.587941	10.412059	50
11	9.557932	9.969616	9.588316	10.411684	49
12	9.558258	9.969567	9.588691	10.411309	48
13	9.558583	9.969518	9.589066	10.410934	47
14	9.558909	9.969569	9.589440	10.410560	46
15	9.559234	9.969419	9.589814	10.410185	45
16	9.559558	9.969370	9.590188	10.409812	44
17	9 559883	9.969321	9.590561	10.409438	43
18	9.560207	9.969272	9.590935	10.409065	42
19	9.560531	9.969223	9.591308	10.408692	41
20	9.560855	9.969173	9.591681	10.408319	40
21	9.561178	9.969124	9.592054	10.407946	39
22	9.561501	9.969075	9.592426	10.407574	38
23	9.561824	9.969025	9.592798	10 407201	37
24	9.562146	9.968976	9.593170	10.406829	36
25	9.562468	9.968926	9.593542	10.406457	35
26	9.562790	9.958877	9.593914	10.406086	34
27	9.563112	9.968827	9.594285	10.405715	33
28	9.563433	9.968777	9.594656	10.405344	32
29	9.563754	9.968728	9.595027	10.405073	31
30	9.564075	9.958678	9.595397	10.404602	30
	Co-ſine	Sine	*Co.Tang.*	Tang.	M

Degree 68.

Degree 21.

Sine	*Co-ſine*	Tangent.	*Co-Tang.*	
9.564075	9.968678	9.595397	10.404602	30
9.564395	9.968628	9.595768	10.404232	29
9.564716	9.968578	9.596138	10.403862	28
9.565036	9.968528	9.596508	10.403492	27
9.565356	9.968478	9.596878	10.403122	26
9.565675	9.968428	9.597247	10.402753	25
9.565995	9.968378	9.597616	10.402384	24
9.566314	9.968328	9.597985	10.402015	23
9.566632	9.968278	9.598354	10.401645	22
9.566951	9.968228	9.598722	10.401277	21
9.567269	9.968178	9.599091	10.400909	20
9.567587	9.968128	9.599459	10.400541	19
9.567904	9.968078	9.599827	10.400173	18
9.568222	9.968027	9.6001 4	10.399806	17
9.568539	9.967977	9.600562	10.399438	16
9.568855	9.967927	9.600929	10.399071	15
9.569172	9.967876	9.601296	10 398704	14
9.569488	9.967826	9.601662	10.398337	13
9.569804	9.967775	9.602029	10.397971	12
9.570120	9.967725	9.602395	10.397605	11
9.570435	9.967674	9.602761	10.397239	10
9.570751	9.967623	9.603127	10.396873	9
9.571065	9.967573	9.603493	10.396507	8
9.571380	9.967522	9.603858	10.396142	7
9.571695	9.967471	9.604223	10.395777	6
9.572009	9.967420	9.604588	10.395412	5
9.572322	9.967370	9.604953	10.395047	4
9.572636	9.967319	9.605317	10.394683	3
9.572949	9.967268	9.605681	10.394318	2
9.573263	9.967217	9.606046	10.393954	1
9.573575	9.967166	9.606409	10.393592	0
Co-ſine	Sine	*Co-Tang.*	Tangent.	M

Degree 68.

Degree 22.

M	Sine	*Co-ſine*	Tangent	*Co-Tang.*
0	9.573575	6.967166	9.605409	10.393590
1	9.573888	9.967115	9.606773	10.393227
2	9.574200	9.967064	9.607136	10.392863
3	9.574512	9.967012	9.607500	10.392500
4	9.574824	9.966961	9.607862	10.392137
5	9.575135	9.966910	9.608225	10.391774
6	9.575447	9.966859	9.608588	10.391412
7	9.575758	9.966807	9.608950	10.391050
8	9.576068	9.966756	9.609312	10.390688
9	9.576379	9.966705	9.609674	0.390326
10	9.576689	9.966653	9.600036	10.389964
11	9.576999	9.966602	9.610397	10.389603
12	9.577309	9.966550	9.610758	10.389241
13	9.577618	9.966499	9.611119	10.388880
14	9.577927	9.966447	9.611480	10.388520
15	9.578236	9.966395	9.611841	10.388159
16	9.578545	9.966344	9.612201	10.387799
17	9.578853	9.966292	9.612561	10.387438
18	9.579161	9.966240	9.612521	10.387078
19	9.579469	9.966188	9.613281	10.385719
20	9.579777	9.966136	9.613641	10.386359
21	9.580084	9.966084	9.614000	10.386000
22	9.580392	9.966032	9.614359	10.385641
23	9.580698	9.965980	9.614718	10.385282
24	9.581005	9.965928	9.615077	10.384923
25	9.581311	9.965876	9.615435	10.384565
26	9.581618	9.965824	9.615793	10.384207
27	9.581923	9.965772	9.616151	10.383448
28	9.582229	9.965720	9.616509	10.383491
29	9.582534	9.965668	9.616867	10.383133
30	9.582840	9.965615	9.617224	10.382776
	Co ſine	Sine	*Co Tang.*	Tangent

Degree 67.

Degree 22.

Sine	Co-ſine	Tangent	Co.Tang.	
9.582840	9.955515	9.617224	10.382776	30
9.583144	9.965553	9.617581	10.382418	29
9.583449	9.965511	9.617938	10.382061	28
9.583753	9.955458	9.618295	10.381705	27
9.584058	9.965406	9.618652	10.381348	26
9.584361	9.965353	9.619008	10.380992	25
9.584665	9.965301	9.619364	10.380635	24
9.584968	9.955248	9.619720	10.380279	23
9.585271	9.955195	9.620076	10.379924	22
9.585574	9.965143	9.620432	10.379563	21
9.585877	9.965090	9.620787	10.379213	20
9.586179	9.955037	9.621142	10.378858	19
9.586481	9.954984	9.521497	10.378503	18
9.586783	9.954931	9.522852	10.378148	17
9.587085	9.964878	9.522206	10.377793	16
9.587386	9.964825	9.522561	10.377489	15
9.587687	9.954772	9.522915	10.377085	14
9.587988	9.954719	9.523259	10.376731	13
9.588239	9.954566	9.623623	10.376377	12
9.588589	9.954613	9.523976	10.376024	11
9.588890	9.954560	9.524330	10.375670	10
9.589190	9.954507	9.524683	10.375317	9
9.589489	9.954454	9.525035	10.374964	8
9.589789	9.954400	9.525388	10.374612	7
9.590088	9.954347	9.625741	10.374259	6
9.590387	9.964294	9.526093	10.373907	5
9.590685	9.954240	9.526445	10.373555	4
9.590984	9.964187	9.626797	10.373203	3
9.591282	9.964133	9.527149	10.372850	2
9.591580	9.954082	9.527501	10.372499	1
9.591878	9.954025	9.527852	10.372148	0
Co ſine	Sine	Co.Tang.	Tangent.	M

Degree 67.

Degree 23.

M	Sine	Co-ſine	Tangent	Co-Tang.
0	9.591878	9.964026	9.627852	10.372148
1	9.592175	9.963972	9.628203	10.371797
2	9.592473	9.963919	9.628554	10.371244
3	9.592770	9.963865	9.628905	10.371095
4	9.593067	9.963811	9.629255	10.370744
5	9.593363	9.963757	9.629606	10.370394
6	9.593659	9.963703	9.629955	10.370044
7	9.593955	9.963650	9.630306	10.369694
8	9.594251	9.963595	9.630655	10.369344
9	9.594547	9.963542	9.631005	10.368995
10	9.594842	9.963488	9.631354	10.368645
11	9.595137	9.963433	9.631704	10.368296
12	9.595432	9.963379	9.632053	10.367947
13	9.595727	9.963325	9.632401	10.367598
14	9.596021	9.963271	9.632750	10.367250
15	9.596315	9.963217	9.633098	10.366901
16	9.596610	9.963102	9.633447	10.366553
17	9.596903	9.963108	9.633795	10.366205
18	9.597196	9.962054	9.634043	10.365857
19	9.597490	9.962999	9.634490	10.365510
20	9.597783	9.962945	9.634838	10.365162
21	9.598075	9.962892	9.635185	10.364815
22	9.598368	9.962836	9.635530	10.364468
23	9.598660	9.962781	9.635879	10.364121
24	9.598952	9.962726	9.636226	10.363774
25	9.599244	9.962672	9.636572	10.363428
26	9.599536	9.962617	9.636918	10.363081
27	9.599827	9.962562	9.637265	10.362735
28	9.600118	9.962507	9.637611	10.362389
29	9.600409	9.962453	9.637956	10.362044
30	9.600700	9.962398	9.638302	10.361698
	Co-ſine	Sine	Co Tang.	Tangent

Degree 66.

Degree 23.

Sine	*Co-ſine*	Tangent	*Co Tang.*	
9.600700	9.962398	9.638302	10.361698	30
9.600990	9.952345	9.638647	10.361353	29
9.601280	9.962288	9.638992	10.351007	28
9.601570	9.952233	9.639337	10.350652	27
9.601860	9.962178	9.639685	10.360318	26
9.602149	9.952122	9.640927	10.359973	25
9.602439	9.952057	9.640371	10.359629	24
9.602728	9.952012	9.640716	10.359284	23
9.603017	9.951957	9.641060	10.358940	22
9.603305	9.951902	9.641404	10.358595	21
9.603594	6.951816	9.641747	10.358258	20
9.603882	9.951791	9.642091	10.357909	19
9.604170	9.951735	9.642434	10.357566	18
9.604457	9.951680	9.642777	10.357223	17
9.604745	9.951624	9.643120	10.356980	16
9.605032	9.961569	9.643463	10.356537	15
9.605319	9.951513	9.643806	10.356194	14
9.605606	9.951458	9.644148	10.355852	13
9.605892	9.951402	9.644490	10.355510	12
9.606179	9.951346	9.644832	10.355168	11
9.606465	9.951290	9.645174	10.354826	10
9.605750	9.951235	9.645516	10.354484	9
9.607039	9.951179	9.645857	10.354142	8
9.607322	9.951123	9.645199	10.353801	7
9.607607	9.951067	9.646540	10.353450	6
9.607892	9.961011	9.646881	10.353119	5
9.608176	9.960955	9.647222	10.352778	4
9.608451	9.950899	9.647562	10.352438	3
9.608745	9.950842	9.647903	10.352097	2
9.609029	9.960785	9.648243	10.351757	1
9.609313	9.950730	9.648583	10.351417	0
Co-ſine	Sine	*Co-Tang.*	Tangent	M

Degree 66.

Degree 24.

M	Sine	*Co-ſine*	Tangent	*Co-Tang.*
0	9.609313	9.960730	9.648585	10.351417
1	9.609597	9.960674	9.648923	10.351077
2	9.609880	9.960617	9.649263	10.350737
3	9.610163	9.960561	9.649602	10.350308
4	9.610446	9.960505	9.649942	10.350058
5	9.610729	9.960448	9.650281	10.349719
6	9.611012	9.960392	9.650520	10.349380
7	9.611294	9.960335	9.650959	10.349041
8	9.611576	9.960279	9.651297	10.348703
9	9.611858	9.960222	9.651636	10.348364
10	9.612140	9.950165	9.651974	10.348025
11	9.612421	9.950109	9.652312	10.347688
12	9.612702	9.960052	9.652550	10.347350
13	9.612983	9.959995	9.652988	10.347012
14	9.613264	9.959938	9.653325	10.346674
15	9.613545	9.959881	9.653663	10.346337
16	9.614825	9.959824	9.654000	10.345999
17	9.614105	9.959768	9.654337	10.345662
18	9.614385	9.959710	9.654674	10.345325
19	9.614665	9.959653	9.655011	10.344989
20	9.614944	9.959596	9.655348	10.344652
21	9.615223	9.959539	9.655684	10.344316
22	9.615502	9.959482	9.656020	10.343980
23	9.615781	9.959425	9.656356	10.343643
24	9.616050	9.959367	9.656692	10.343308
25	9.616338	9.959310	9.657028	10.342972
26	9.616616	9.959253	9.657363	10.342636
27	9.616894	9.959195	9.657699	10.342301
28	9.617172	9.959138	9.658034	10.341966
29	9.617450	9.959080	9.658369	10.341631
30	9.617727	9.959023	9.658701	10.341299
	Co ſine	Sine	*Co Tang*	Tangent.

Degree 65.

Degree 24.

Sine	Co-ſine	Tangent	Co Tang	
9.617727	9.959023	9.558704	10.341296	30
9.618004	9.958965	9.659039	10.340926	29
9.618581	9.958908	9.659373	10.340627	28
9.518558	9.958850	9.659708	10.340292	27
9.618834	9.958792	9.560042	10.339958	26
9.519110	9.958734	9.660276	10.339524	25
9.519386	9.958677	9.560710	10.339290	24
9.619662	9.958619	9.651043	10.338957	23
9.619938	9.958561	9.651377	10.338623	22
9.620213	9.958503	9.651710	10.338290	21
9.620488	6.958445	9.662043	10.337956	20
9.620763	9.958387	9.562376	10.337623	19
9.621038	9.958329	9.562709	10.337291	18
9.621313	9.958271	9.663042	10.336958	17
9.621587	9.958212	9.553374	10.336626	16
9.621861	9.958154	9.653707	10.336293	15
9.622135	9.958096	9.564039	10.335961	14
9.622409	9.958038	9.564371	10.335629	13
9.622682	9.957979	9.564703	10.335297	12
9.622956	9.957921	9.665035	10.334965	11
9.623229	9.957862	9.565366	10.334634	10
9.623502	9.957804	9.565697	10.334302	9
9.623775	9.957745	9.566029	10.333971	8
9.624047	9.957687	9.666360	10.333640	7
9.624319	9.957628	9.566691	10.333309	6
9.624591	9.957570	9.567021	10.332979	5
9.624863	9.957511	9.667352	10.332648	4
9.625134	9.957452	9.667682	10.332318	3
9.625406	9.957393	9.668012	10.331987	2
9.625677	9.957334	9.568343	10.331657	1
9.625948	9.957275	9.668672	10.331327	0
Co-ſine	Sine	Co Tang.	Tangent	M

Degree 65.

Degree 25.

M	Sine	Co·ſine	Tangent	Co-Tang.
0	9.625948	9.957276	9.668672	10.331327
1	9.621219	9.957217	9.669002	10.330998
2	9.626490	9.957158	9.669332	10.330668
3	9.626759	9.957099	9.669661	10.330339
4	9.627030	9.957040	9.669990	10.330009
5	9.627300	9.956981	9.670320	10.329680
6	9.627570	9.9,6922	9.670649	10.329351
7	9.627840	9.956862	9.670977	10.329022
8	9.628109	9.956803	9.671305	10.328694
9	9.628378	9.956744	9.671634	10.328365
10	9.628647	9.956684	9.671963	10.328035
11	9.628916	9.956625	9.672291	10.327609
12	9.629184	9.956565	9.672619	10.327381
13	9.629453	9.956506	9.672947	10.327053
14	9.629721	9.956446	9.673274	10.326725
15	9.629989	9 956387	9.673603	10.326398
16	9.630257	9.956327	9.673929	10.326070
17	9.630524	9.956267	9.674259	10.325743
18	9.630792	9.956208	9.674584	10.325416
19	9.631059	9.956148	9.674910	10.325089
20	9.631326	9.956088	9.67.237	10.324763
21	9.631592	9.956029	9.675564	10.324436
22	9.631859	9.955969	9.675890	10.324110
23	9.632125	9.955909	9.676216	10.323783
24	9.632392	9.955849	9.676543	10.323457
25	9.632957	9.955789	9.676869	10.323131
26	9.632923	9.955739	9.677194	10.322805
27	9.633189	9.955669	9.677520	10.322480
28	9.633454	9.955609	9.677845	10.322154
29	9.633719	9.955548	9.678171	10.321829
30	9.633984	9.955488	9.678496	10.321504
	Co ſine	Sine	Co·Tang	Tangent.

Degree 64.

Degree 25.

Sine	Co ſine	Tangent	Co.Tang.	
9.633984	9.955438	9.678496	10.321504	30
9.634249	9.955428	9.678821	10.321179	29
9.634514	9.955867	9.679146	10.320854	28
9.634778	9.955307	9.679471	10.320529	27
9.635042	9.955246	9.679795	10.320205	26
9.635306	9.955286	9.680120	10.319880	25
9.635570	9.955125	9.680444	10.319556	24
9.635833	9.955065	9.680768	10.319232	23
9.636097	9.955004	9.681092	10.318908	22
9.636360	9.954944	9.681416	10.318584	21
9.636623	9.954883	9.681740	10.318260	20
9.636886	9.954823	9.682063	10.317937	19
9.637148	9.954762	9.682387	10.317613	18
9.637411	9.954701	9.682710	10.317290	17
9.637673	9.954640	9.683033	10.316967	16
9.637935	9.954579	9.683356	10.316644	15
9.638197	9.954518	9.683678	10.316321	14
9.638458	9.954457	9.684001	10.315999	13
9.638720	9.954396	9.684324	10.315676	12
9.638981	9.954335	9.684646	10.315354	11
9.639242	9.954274	9.684968	10.315032	10
9.639503	9.954213	9.685290	10.314710	9
9.639764	9.954152	9.685612	10.314388	8
9.640024	9.954090	9.685934	10.314066	7
9.640284	9.954029	9.686255	10.313745	6
9.640544	9.953968	9.686577	10.313423	5
9.640804	9.953906	9.686898	10.313102	4
9.641064	9.953845	9.687219	10.312781	3
9.641323	9.953783	9.687540	10.312460	2
9.641583	9.953722	9.687851	10.312138	1
9.641842	9.953660	9.688182	10.311818	0
Co-ſine	Sine	Co.Tang.	Tangent.	M

Degree 64.

Degree 26.

M	Sine	*Co-ſine*	Tangent	*Co-Tang.*
0	9.641842	9.953650	9.688182	10.311818
1	9.642101	9.953598	9.688502	10.311498
2	9.642360	9.953537	9.688823	10.311177
3	9.642618	9.953475	9.689143	10.310857
4	9.642876	9.953413	9.689493	10.310537
5	9.643135	9.953351	9.689783	10.310217
6	9.643393	9.953290	9.690103	10.309897
7	9.643650	9.953228	9.690423	10.309577
8	9.643908	9.953166	9.690742	10.309258
9	9.644165	9.953104	9.691063	10.308938
10	9.644423	9.953042	9.691381	10.308619
11	9.644680	9.952980	9.691700	10.308300
12	9.644936	9.952917	9.692019	10.307981
13	9.645193	9.952855	9.692338	10.307662
14	9.645449	9.952793	9.692655	10.307343
15	9.645706	9.952731	9.692975	10.307025
16	9.645962	9.952668	9.693293	10.306706
17	9.646218	9.952606	9.693612	10.306388
18	9.646473	9.952544	9.693930	10.306070
19	9.646729	9.952481	9.694248	10.305752
20	9.646984	9.952419	9.694566	10.305434
21	9.647239	9.952356	9.694883	10.305117
22	9.647494	9.952294	9.695201	10.304799
23	9.647749	9.952231	9.695518	10.304482
24	9.648004	9.952168	9.695835	10.304164
25	9.648258	9.952105	9.696153	10.303847
26	9.648512	9.952043	9.696470	10.303530
27	9.648766	9.951980	9.696786	10.303213
28	9.648020	9.951917	9.697103	10.302897
29	9.649274	9.951854	9.697420	10.302580
30	9.649527	9.951791	9.697738	10.302264
	Co-ſine	Sine	*Co-Tang.*	Tangent

Degree 36.

Degree 26.

Sine	Co-ſine	Tangent	Co Tang	
9.649527	9.951791	9.697738	10.302264	30
9.649781	9.951728	9.698052	10.301947	29
9.650034	9.951665	9.698369	10.301631	28
9.650287	9.951602	9.698685	10.301315	27
9.650519	9.951539	9.699001	10.300999	26
9.650798	9.951476	9.699316	10.300684	25
9.651044	9.951412	9.699632	10.300368	24
9.651296	9.951349	9.699947	10.300052	23
9.651648	9.951285	9.700263	10.299737	22
9.6518 0	9.951222	9.700578	10.299422	21
9.652052	9.951159	9.700893	10.299107	20
9.652303	9.951095	9.701208	10.298792	19
9.652556	9.951032	9.701522	10.298477	18
9.652806	9.950968	9.701837	10.298163	17
9.653057	9.950905	9.702152	10.297848	16
9.653307	9.950841	9.702466	10.297534	15
9.653558	9.950777	9.702780	10.297219	14
9.653808	9.950714	9.703095	10.296905	13
9.654059	9.950650	9.703409	10.296591	12
9.654309	9.950586	9.703722	10.296277	11
9.654558	9.950522	9.704036	10.295964	10
9.654808	9.950458	9.704350	10.295650	9
9.655057	9.990394	9.704663	10.295337	8
9.655307	9.950330	9.704976	10.295023	7
9.655556	9.950266	9.705290	10.294710	6
9.655805	9.950202	9.7 5603	10.294397	5
9.656053	9.950138	9.705915	10.294084	4
9.656302	9.950074	9.706228	10.293771	3
9.656550	9.950009	9.706541	10.293459	2
9.656799	9.949945	9.706853	10.293146	1
9.656447	9.949881	9.707166	10.292834	0
Co-ſine	Sine	*Co-Tang.*	Tangent	M

Degree 63.

Degree 27.

M	Sine	*Co ſine*	Tangent	*Co-Tang.*
0	9.657047	9.949880	9.707166	10.292834
1	9.657295	9.949816	9.707478	10.292523
2	9.657542	9.949752	9.707790	10.292210
3	9.657790	9.949687	9.708102	10.291897
4	9.658037	9.949623	9.708414	10.291586
5	9.658284	9.949558	9.708725	10.291274
6	9.658531	9.949494	9.709037	10.290962
7	9.658777	9.949429	9.709349	10.290651
8	9.659024	9.949364	9.709660	10.290340
9	9.659271	9.949300	9.709971	10.290029
10	9.659517	9.949238	9.710282	10.289718
11	9.659763	9.949174	9.710593	10.289407
12	9.660009	9.949105	9.710904	10.289096
13	9.660255	9.949040	9.711214	10.288785
14	9.660500	9.948976	9.711525	10.288475
15	9.660746	9.948910	9.711836	10.288164
16	9.660991	9.948845	9.712146	10.287854
17	9.661236	9.948760	9.712456	10.287544
18	9.661481	9.948715	9.712766	10.287234
19	9.661726	9.948650	9.713076	10.286924
20	9.661970	9.948584	9.713285	10.286614
21	9.662214	9.948519	9.713695	10.286305
22	9.662459	9.948453	9.714005	10.285995
23	9.662702	9.948388	9.714314	10.285686
24	9.662947	9.948323	9.714624	10.285376
25	9.663190	9.948257	9.714933	10.285067
26	9.663433	9.948191	9.715241	10.284758
27	9.663677	9.948126	9.715550	10.284449
28	9.663920	9.948060	9.715859	10.284140
29	9.664164	9.947995	9.716168	10.283832
30	9.664405	9.947929	9.716477	10.283523
	Co-ſine	Sine	*Co-Tang.*	Tangent

Degree 62.

Degree 27.

Sine	*Co-ſine*	Tangent	*Co Tang.*	
9.664406	9.947929	9.716477	10.283523	30
9.664648	9.947863	9.716785	10.283215	29
9.664891	9.947797	9.717093	10.282907	28
9.665133	9.947731	9.717401	10.282598	27
9.665375	9.947665	9.717709	10.282290	26
9.665617	9.947599	9.718017	10.281983	25
9.665858	9.947533	9.718325	10.281675	24
9.666100	9.947467	9.718633	10.281367	23
9.666341	9.947401	9.718940	10.281060	22
9.666583	9.947335	9.719248	10.280752	21
9.666824	6.947269	9.719555	10.280445	20
9.667065	9.947203	9.719862	10.280138	19
9.667305	9.947136	9.720169	10.279831	18
9.667545	9.947070	9.720475	10.279524	17
9.667785	9.947004	9.720783	10.279217	16
9.668025	9.946937	9.721089	10.278911	15
9.668265	9.946871	9.721395	10.278604	14
9.668505	9.946804	9.721702	10.278298	13
9.668746	9.946738	9.7220 8	10.277991	12
9.668986	9.946671	9.722315	10.277685	11
9.669225	9.946604	9.722621	10.277379	10
9.669464	9.946537	9.722927	10.277073	9
9.669703	9.946471	9.723232	10.276768	8
9.669942	9.946404	9.723538	10.276462	7
9.670181	9.946337	9.723843	10.276156	6
9.670419	9.946270	9.724149	10.275851	5
9.670657	9.946203	9.724454	10.275546	4
9.670896	9.946136	9.724759	10.275240	3
9.671134	9.946069	9.725065	10.274935	2
9.671372	9.946002	9.725369	10.274630	1
9.671609	9.945935	9.725674	10.274326	0
Co-ſine	Sine	*Co Tang.*	Tangent	M

Degree 26.

Degree 28.

M	Sine	Co-ſine	Tangent	Co-Tang.
0	9.671609	9.945935	9.725674	10.274326
1	9.671847	9.945868	9.725979	10.274021
2	9.672084	9.945800	9.726284	10.273816
3	9.672321	9.945733	9.726588	10.273412
4	9.672558	9.945666	9.726892	10.273107
5	9.672795	9.945598	9.727197	10.272803
6	9.673032	9.945531	9.727501	10.272499
7	9.673268	9.945463	9.727805	10.272195
8	9.673505	9.945396	9.728109	10.271891
9	9.673741	9.945328	9.728412	10.271587
10	9.673977	9.945261	9.728716	10.271284
11	9.674213	9.945193	9.729020	10.270980
12	9.674448	9.945125	9.729323	10.270677
13	9.674684	9.945058	9.729626	10.270374
14	9.674919	9.944990	9.729929	10.270070
15	9.675154	9.944922	9.730232	10.269767
16	9.675389	9.944854	9.730535	10.269464
17	9.675623	9.944786	9.730838	10.269162
18	9.675859	9.944718	9.731141	10.268859
19	9.676094	9.944650	9.731443	10.268555
20	9.676328	9.944582	9.731746	10.268254
21	9.676502	9.944514	9.732048	10.267952
22	9.676796	9.944446	9.732351	10.267649
23	9.677030	9.944377	9.732653	10.267347
24	9.677264	9.944309	9.732955	10.267045
25	9.677497	9.944241	9.733257	10.266743
26	9.677731	9.944172	9.733558	10.266441
27	9.677964	9.944104	9.733860	10.266140
28	9.678197	9.944016	9.734162	10.265838
29	9.678430	9.943967	9.734463	10.265537
30	9.678663	9.943898	9.734764	10.265236
	Co-ſine	Sine	Co-Tang.	Tangent

Degree 61.

Degree 28.

Sine	Co-sine	Tangent	Co-Tang.	
9.578663	9.943899	9.734764	10.265236	30
9.578895	9.943830	9.735666	10.264934	29
9.679128	9.943761	9.735362	10.264633	28
9.579360	9.943692	9.735668	10.264332	27
9.579592	9.943624	9.735968	10.264031	26
9.679824	9.943555	9.736269	10.263731	25
9.580056	9.943486	9.735570	10.263430	24
9.680288	9.943417	9.736870	10.263130	23
9.680519	9.943348	9.737171	10.262829	22
9.580750	9.943279	9.737471	10.262529	21
9.580982	9.943210	9.737771	10.262229	20
9.681213	9.943141	9.738071	10.261929	19
9.581443	9.943071	9.738371	10.261629	18
9.581674	9.943003	9.738571	10.261329	17
9.581904	9.942933	9.738971	10.261029	16
9.682135	9.942864	9.739271	10.260729	15
9.582365	9.942795	9.739570	10.260430	14
9.682597	9.942725	9.739870	10.260130	13
9.682825	9.942656	9.740169	10.259831	12
9.583055	9.942587	9.740458	10.259532	11
9.583281	9.942517	9.740767	10.259233	10
9.683514	9.942448	9.741066	10.258934	9
9.583743	9.942378	9.741365	10.258635	8
9.583972	9.942308	9.741664	10.258336	7
9.584201	9.942239	9.741962	10.258038	6
9.684430	9.942169	9.742261	10.257739	5
9.584658	9.942099	9.742559	10.257441	4
9.684887	9.942029	9.742858	10.257142	3
9.585115	9.941959	9.743156	10.256844	2
9.985343	9.941889	9.743454	10.256546	1
9.685571	9.941819	9.743751	10.256248	0
Co ſine	Sine	Co Tang	Tangent.	M

Degree 61.

Degree 29.

M	Sine	Co-ſine	Tangent	Co-Tang.
0	9.685571	9.941819	9.743752	10.256248
1	9.685799	9.941749	9.744050	10.255950
2	9.686027	9.941679	9.744348	10.255652
3	9.686254	9.941609	9.744645	10.255355
4	9.686482	9.941539	9.744943	10.255057
5	9.686709	9.941468	9.745240	10.254760
6	9.686936	9.941398	9.745538	10.254462
7	9.687163	9.941328	9.745835	10.254165
8	9.687389	9.941257	9.746132	10.254868
9	9.687616	9.941187	9.746429	10.253571
10	9.687842	9.941116	9.746726	10.253274
11	9.688069	9.941046	9.747023	10.252977
12	9.688295	9.940975	9.747319	10.252580
13	9.688523	9.940905	9.747616	10.252384
14	9.688747	9.940834	9.747912	10.252087
15	9.688972	9.940763	9.748209	10.251791
16	9.689198	9.940693	9.748505	10.251495
17	9.689421	9.940622	9.748801	10.251199
18	9.689648	9.940551	9.749097	10.250902
19	9.689873	9.940480	9.749393	10.250607
20	9.690098	9.940409	9.749689	10.250311
21	9.590323	9.940338	9.749985	10.259015
22	9.690548	9.940267	9.750281	10.249719
23	9.690772	9.940196	9.750576	10.249424
24	9.690996	9.940125	9.750872	10.248123
25	9.691220	9.940053	9.751167	10.248833
26	9.691444	9.939982	9.751462	10.248538
27	9.691668	9.939911	9.751757	10.248243
28	9.691892	9.939840	9.752052	10.247948
29	9.692115	9.939768	9.752347	10.247653
30	9.692339	9.939697	9.752642	10.247358
	Co-ſine	Sine	Co-Tang	Tangent.

Degree 60.

Degree 29.

M	Sine	Co-sine	Tangent	Co-Tang.	
30	9.692339	9.939697	9.752642	10.247358	30
31	9.692562	9.939625	9.752937	10.247063	29
32	9.692758	9.939554	9.753231	10.246769	28
33	9.693008	9.939482	9.753525	10.246474	27
34	9.693231	9.939412	9.753820	10.246180	26
35	9.693453	9.939339	9.754115	10.245885	25
36	9.693676	9.939267	9.754409	10.245591	24
37	9.693898	9.939195	9.754703	10.245297	23
38	9.694120	9.939125	9.754997	10.245003	22
39	9.694342	9.939051	9.755291	10.244709	21
40	9.694564	9.938980	9.755584	10.244415	20
41	9.694786	9.938908	9.755878	10.244122	19
42	9.695007	9.938835	9.755 72	10.243828	18
43	9.695229	9.938763	9.756465	10.243535	17
44	9.695450	9.938691	9.756759	10.243241	16
45	9.695671	9.938619	9.757052	10.242948	15
46	9.695892	9.938547	9.757345	10.242655	14
47	9.696113	9.938475	9.757638	10.242362	13
48	9.696334	9.938402	9.757931	10.242069	12
49	9.696554	9.938330	9.758224	10.241776	11
50	9.696774	9.938257	9.758517	10.241483	10
51	9.696995	9.938185	9.758810	10.241190	9
52	9.697215	9.938112	9.759102	10.240898	8
53	9.697435	9.938040	9.759395	10.240605	7
54	9.697654	9.937957	6.759587	10.240313	6
55	9.697871	9.937895	9.759979	10.240021	5
56	9.698033	9.937822	9.760271	10.239728	4
57	9.698313	9.937740	9.760564	10.239436	3
58	9.698532	9.937671	9.760856	10.239144	2
59	9.698751	9.937603	9.761147	10.238852	1
60	9.698970	9.937531	9.761439	10.238561	0
	Co-sine	Sine	Co Tang	Tangent.	M

Degree 60.

Degree 30.

M	Sine	Co-ſine	Tangent	Co-Tang.	
0	9.598970	9.937531	9.761439	10.238561	60
1	9.699189	9.937458	9.761731	10.238259	59
2	9.699407	9.937385	9.762034	10.237977	58
3	9.699526	9.937312	9.762314	10.237686	57
4	9.699844	9.937238	9.762506	10.237394	56
5	9.700062	9.937165	9.762897	10.237103	55
6	9.700280	9.937092	9.763188	10.236812	54
7	9.700498	9.937019	9.763479	10.236521	53
8	9.700716	9.936945	9.763770	10.236230	52
9	9.700933	9.936872	9.764061	10.235939	51
10	9.701151	9.936799	9.764352	10.235648	50
11	9.701568	9.936725	9.764643	10.235357	49
12	9.701585	9.936652	9.764933	10.235067	48
13	9.701802	9.936578	9.765224	10.234776	47
14	9.702019	9.936505	9.765514	10.234485	46
15	9.702236	9.936431	9.765805	10.234195	45
16	9.702452	9.936357	9.766095	10.233905	44
17	9.702669	9.936284	9.766385	10.233615	43
18	9.702885	9.936210	9.766675	10.233325	42
19	9.703101	9.936136	9.766965	10.233035	41
20	9.703317	9.936062	9.767255	10.232745	40
21	9.703533	9.935980	9.767545	10.232455	39
22	9.703748	9.935914	9.767834	10.232166	38
23	9.703964	9.935840	9.768124	10.231876	37
24	9.704179	9.935766	9.768413	10.231587	36
25	9.704395	9.935692	9.768703	10.231297	35
26	9.704610	9.935618	9.768992	10.231008	34
27	9.704825	9.935543	9.769281	10.230719	33
28	9.705040	9.935469	9.769570	10.230430	32
29	9.705254	9.935395	9.769859	10.230141	31
30	9.705469	9.935320	9.770148	10.229852	30
	Co-ſine	Sine	Co Tang	Tangent	M

Degree 59.

Degree 30.

M	Sine	Co-ſine	Tangent.	Co-Tang.	
	9.705469	9.935320	9.770148	10.229852	30
	9.705683	9.935246	9.770437	10.229363	29
	9.705867	9.935171	9.770726	10.229274	28
	9.706112	9.935097	9.771015	10.228985	27
	9.706326	9.935022	9.771303	10.228697	26
	9.706529	9.934948	9.771592	10.228408	25
	9.706753	9.934873	9.771800	10.228120	24
	9.706967	9.934798	9.772168	10.227833	23
	9.707180	9.934723	9.772456	10.227543	22
	9.707393	9.934649	9.772745	10.227255	21
	9.707606	9.934574	9.773033	10.226967	20
	9.707819	9.934499	9.773321	10.226679	19
	9.708032	9.934424	9.773008	10.226391	18
	9.708245	9.934349	9.773896	10.226104	17
	9.708457	9.934274	9.774184	10.225816	16
	9.708670	9.934199	9.774471	10.225519	15
	9.708882	9.934123	9.774759	10.225241	14
	9.709094	9.934048	9.775046	10.224954	13
	9.709305	9.933973	6.775323	10.224666	12
	9.709518	9.933897	9.775621	10.224379	11
	9.709730	9.933822	9.775908	10.224092	10
	9.709941	9.933747	9.776195	10.223805	9
	9.710153	9.933671	9.776482	10.223518	8
	9.710364	9.933596	9.776768	10.223232	7
	9.710575	9.933520	9.777005	10.222945	6
	9.710786	9.933444	9.777342	10.222658	5
	9.710997	9.933369	9.777628	10.222372	4
	9.711208	9.933293	9.777915	10.222085	3
	9.711418	9.933217	9.778201	10.221799	2
	9.711629	9.933141	9.778487	10.221513	1
	9.711839	9.933056	9.778774	10.221226	0
	Co-ſine	Sine	Co-Tang.	Tangent.	M

Degree 59.

Degree 31.

M	Sine	Co ſine	Tangent	Co-Tang.	
0	9.711839	9.933066	9.778774	10.221225	60
1	9.712049	9.932990	9.779060	10.220940	59
2	9.712259	9.932914	9.779346	10.220654	58
3	9.712469	9.932838	9.779632	10.220368	57
4	9.712679	9.932761	9.779918	10.220082	56
5	9.712889	9.932685	9.780203	10.219795	55
6	9.713098	9.932609	9.780489	10.219511	54
7	9.713308	9.932533	9.780775	10.219225	33
8	9.713517	9.932457	9.781060	10.218940	52
9	9.713726	9.932380	9.782346	10.318654	51
10	9.713935	9.932304	9.782631	10.218369	50
11	9.714144	9.932447	9.781916	10.218084	49
12	9.714352	9.932151	9.782202	10.217799	48
13	9.714561	9.932074	9.782485	10.217514	47
14	9.714769	9.931990	9.782771	10.217229	46
15	9.714977	9.931921	9.783056	10.216944	45
16	9.715186	9.931845	9.783341	10.216659	44
17	9.715394	9.931768	9.783626	10.216374	43
18	9.715601	9.931691	9.783910	10.216090	42
19	9.715809	9.931614	9.784195	10.215805	41
20	9.716017	9.931537	9.784479	10.215520	40
21	9.716124	9.931460	9.784764	10.215236	39
22	9.716431	9.931383	9.785048	10.214942	38
23	9.716639	9.931306	9.785332	10.214668	37
24	9.716846	9.931229	9.785616	10.214384	36
25	9.717053	9.931152	9.785900	10.214099	35
26	9.717259	9.931079	9.786184	10.213816	34
27	9.717456	9.930998	9.786463	10.213532	33
28	9.717672	9.930920	9.786752	10.213248	32
29	9.717869	9.930843	9.787036	10.212964	31
30	9.718085	9.930766	9.787319	10.212681	30
	Co-ſine	Sine	Co Tang.	Tangent	M

Degree 58.

Degree 31.

Sine	Co ſine	Tangent.	Co-Tang.	
9.718085	9.930765	9.787319	10.212681	30
9.718291	9.930688	9.787603	10.212397	29
9.718497	9.930611	9.787885	10.212114	28
9.718703	9.930533	9.788170	10.211830	27
9.718909	9.930456	9.788453	10.211547	26
9.719114	9.930378	9.788736	10.211264	25
9.719320	9.930300	9.789019	10.210981	24
9.719525	9.930223	9.789302	10.210698	23
9.719730	9.930145	9.789585	10.210415	22
9.719935	9.930067	9.789868	10.210132	21
9.720140	9.929989	9.790151	10.209849	20
9.720345	9.929911	9.790433	10.209566	19
9.720549	9.929833	9.790716	10.209284	18
9.720754	9.929755	9.790999	10.209001	17
9.720958	9.929577	9.791281	10.208719	16
9.721162	9.929599	9.791563	10.208436	15
9.721366	9.929521	9.791846	10 208154	14
9.721570	9.929442	9.792128	10.207872	13
9.721774	9.929364	6.792410	10.207590	12
9.721978	9.929283	9.792592	10.207308	11
9.722181	9.929207	9.792974	10.207024	10
9.722385	9.929129	9.793256	10.206744	9
9.722588	9.929050	9.793538	10.206462	8
9.722791	9.928972	9.793819	10.206180	7
9.722994	9.928893	9.794101	10.205899	6
9.723197	9.928814	9.794383	10.205627	5
9.723420	9.928736	9.794664	10.205236	4
9.723603	9.928756	9.794945	10.205054	3
9.723805	9.928578	9.795227	10.204773	2
9.724007	9.928499	9.795508	10.204493	1
9.724219	9.928420	9.795789	10.204211	0
Co-ſine	Sine	Co-Tang.	Tangent.	M

Degree 58.

Degree 32.

M	Sine	Co-ſine	Tangent	Co-Tang.	
0	9.724210	9.928420	9.795789	10.204211	60
1	9.724412	9.928341	9.796070	10.203930	59
2	9.724614	9.928262	9.796351	10.203649	58
3	9.724816	9.928183	9.796632	10.203368	57
4	9.725017	9.928104	9.796913	10.203087	56
5	9.725219	9.928025	9.797194	10.202806	55
6	9.725620	9.927946	9.797474	10.202522	54
7	9.725622	9.927867	9.797755	10.202245	33
8	9.725823	9.927787	9.798036	10.201964	52
9	9.726024	9.927708	9.798316	10.201684	51
10	9.726225	9.927628	9.798596	10.201401	50
11	9.726426	9.927549	9.798877	10.201123	49
12	9.726625	9.927469	9.799157	10.200843	48
13	9.726827	9.927390	9.799437	10.200563	47
14	9.727027	9.927310	9.799717	10.200283	46
15	9.727228	9.927231	9.799997	10.200003	45
16	9.727428	9.927151	9.800277	10.199723	44
17	9.727628	9.927071	9.800557	10.199443	43
18	9.727828	9 926991	9.800836	10.199163	42
19	9.728027	9.926911	9.801116	10.198884	41
20	9.728227	9.926831	9.801396	10.198604	40
21	9.728427	9.926751	9.801675	10.198325	3
22	9.728626	9.926671	9.801955	10.198045	3
23	9.728825	9.926591	9.802234	10.197766	3
24	9.729024	9.926511	9.802513	10.197487	3
25	9.729223	9.926431	9.802792	10.197207	3
26	9.729422	9.926351	9.803072	10.196928	3
27	9.729621	9.926270	9.803351	10.196649	3
28	9.729820	9.926190	9.803630	10.196370	3
29	9.730018	9.926110	9.803908	10.196091	3
30	9.730216	9.926029	9.804187	10.195813	3
	Co-ſine	Sine	Co-Tang.	Tangent	M

Degree 57.

Degree 32.

M	Sine	Co ſine	Tangent	Co-Tang.	
30	9.730216	9.926079	9.804187	10.195813	30
31	9.730415	9.925949	9.804465	10.195534	29
32	9.730613	9.925868	9.804745	10.195255	28
33	9.730811	9.925787	9.805023	10.194977	27
34	9.731009	9.925707	9.805302	10.194693	25
35	9.731206	9.925626	9.805550	10.194420	25
36	9.731404	9.925545	9.805859	10.194141	24
37	9.731601	9.925464	9.805137	10.193863	21
38	9.731799	9.925384	9.806415	10.193585	22
39	9.731995	9.925303	9.806693	10.193309	21
40	9.732193	9.925222	9.806971	10.192028	20
41	9.732390	9.925141	9.807249	10.192751	19
42	9.732587	9.925060	9.807527	10.192433	18
43	9.732784	9.924978	9.807805	10.192195	17
44	9.732980	9.924897	9.808083	10.191917	16
45	9.733177	9.924816	9.808361	10.191639	15
46	9.733373	9.924735	9.808638	10.191362	14
47	9.733569	9.924653	9.808916	10.191084	13
48	9.733765	9.924572	9.809193	10.190807	12
49	9.733961	9.924491	9.809471	10.190529	11
50	9.734157	9.924409	9.809748	10.190252	10
51	9.734353	9.924328	9.810025	10.189975	9
52	9.734548	9.924246	9.810302	10.189697	8
53	9.734744	9.924164	9.810580	10.189420	7
54	9.734939	9.924083	9.810857	10.189143	6
55	9.735134	9.924001	9.811134	10.188866	5
56	9.735330	9.923919	9.811410	10.188589	4
57	9.735525	9.923837	9.811687	10.188313	3
58	9.735719	9.923755	9.811964	10.188036	2
59	9.735914	9.923673	9.812241	10.187759	1
60	9.736109	9.923591	9.812517	10.187483	0
	Co-ſine	Sine	Co-Tang.	Tangent.	M

Degree 57.

Degree 33.

M	Sine	Co ſine	Tangent	Co-Tang	
0	9.736109	9.923591	9.812517	10.187483	60
1	9.736309	9.923509	9.812794	10.187206	59
2	9.736497	9.923427	9.813070	10.186430	58
3	9.736692	9.923340	9.813347	10.186053	57
4	9.736880	9.923203	9.813623	10.186377	56
5	9.737080	9.923180	9.813899	10.186101	55
6	9.737274	9.923098	9.814175	10.185824	54
7	9.737467	9.923016	9.814452	10.185548	53
8	9.737661	9.922930	9.814728	10.185272	52
9	9.737854	9.922851	9.815004	10.184996	51
10	9.738048	9.922768	9.815279	10.184720	50
11	9.738241	9.922680	9.815555	10.184445	49
12	9.738434	9.922605	9.815831	10.184169	48
13	9.738627	9.922520	9.816107	10.183893	47
14	9.738820	9.922438	9.816382	10.183617	46
15	9.739013	9.922355	9.816658	10.183342	45
16	9.739205	9.922272	9.816933	10.183066	44
17	9.739397	9.922189	9.817209	10.182791	43
18	9.739590	9.922105	9.817484	10.182516	42
19	9.739783	9.922023	9.817759	10.182040	41
20	9.739975	9.921940	9.818035	10.181965	40
21	9.740107	9.921857	9.818310	10.181690	39
22	9.740359	9.921770	9.818585	10.181415	38
23	9.740550	9.921690	9.818860	10.181140	37
24	9.740742	9.921907	9.819135	10.180365	36
25	9.740934	9.921534	9.819410	10.180590	35
26	9.741125	9.921441	9.819684	10.189315	34
27	9.741316	9.921357	9.819959	10.180041	33
28	9.741507	9.921274	9.820234	10.179766	32
29	9.741698	9.921190	9.820562	10.179492	31
30	9.741889	9.921100	9.820783	10.179217	30
	Co ſine	Sine	Co-Tang	Tangent	M

Degree 56.

Degree 33.

M	Sine	Co ſine	Tangent	Co Tang.	
30	9.742889	9.922107	9.820783	10.179217	30
31	9.742080	9.921023	9.821057	10.178943	29
32	9.742271	9.920939	9.821332	10.178668	28
33	9.742461	9.920855	9.821606	10.178394	27
34	9.742650	9.920772	9.821880	10.178120	25
35	9.742842	9.920688	9.822154	10.177846	25
36	9.743032	9.920604	9.822429	10.177571	24
37	9.743223	9.920520	9.822703	10.177297	23
38	9.743412	9.920436	9.822977	10.177023	22
39	9.743602	9.920352	9.823250	10.176739	21
40	9.743792	9.920268	9.823524	10.176476	20
41	9.743982	9.920184	9.823798	10.176202	19
42	9.744171	9.920093	9.824072	10.175928	18
43	9.744361	9.920015	9.824345	10.175655	17
44	9.744550	9.919931	9.824619	10.175381	16
45	9.744739	9.919845	9.824892	10.175108	15
46	9.745928	9.919762	9.825166	10.174834	14
47	9.745117	9.919577	9.825439	10.174560	13
48	9.745306	9.919393	9.825713	10.174287	12
49	9.745494	9.919508	9.825986	10.174014	11
50	9.745683	9.919424	9.826259	10.173741	10
51	9.745871	9.919339	9.826532	10.173468	9
52	9.746059	9.919254	9.826805	10.173195	8
53	9.746248	9.919169	9.827078	10.172922	7
54	9.746436	9.919083	9.827351	10.172649	6
55	9.746624	9.918999	9.817724	10.172376	5
56	9.745811	9.918915	9.827897	10.172103	4
57	9.745999	9.918830	9.828170	10.171830	3
58	9.747167	9.918744	9.828442	10.171558	2
59	9.747374	9.918656	9.828715	10.171285	1
60	9.747562	9.918574	9.828987	10.171012	0
	Co-ſine	Sine	Co-Tang.	Tangent.	M

Degree 56.

Degree 34.

M	Sine	Co ſine	Tangent	Co-Tang.	
0	9.747562	9.918574	9.828937	10.171012	6
1	9.747749	9.918489	9.829260	10.170740	5
2	9.747936	9.918404	9.829532	10.170468	5
3	9.748123	9.918318	9.829805	10.170195	57
4	9.748310	9.918233	9.830077	10.169923	5
5	9.748497	9.918147	9.830349	10.169651	5
6	9.748683	9.918062	9.830621	10.169 79	5
7	9.748870	9.917976	9.830893	10.169156	5
8	9.749056	9.917891	9.831165	10.168834	5
9	9.749242	9.917805	9.831437	10.168503	5
10	9.749429	9.917719	9.831705	10.168291	5
11	9.749615	9.917634	9.831981	10.168019	4
12	9.749801	9.917548	9.832253	10.167747	4
13	9.749986	9.917462	9.832525	10.167475	4
14	9.750172	9.917376	9.832796	10.167204	4
15	9.750358	9.917290	9.833068	10.166932	4
16	9.750543	9.917204	9.833339	10.166660	4
17	9.750729	9 917118	9.833611	10.166389	4
18	9.750914	9.917032	9.833882	10.166118	4
19	9.751099	9.916945	9.834154	10.165846	4
20	9.751284	9.916859	9.834425	10.165575	4
21	9.751469	9.916773	9.834696	10.165304	3
22	9.751954	9.916686	9.834967	10.165033	3
23	9.751838	9.916600	9.835238	10.164762	3
24	9.752023	9.916514	9.835509	10.164491	3
25	9.752207	9.916427	9.835780	10.164220	3
26	9.752392	9.916240	9.836051	10.163949	3
27	9.752576	9.916254	9.836322	10.163678	3
28	9.752760	9.916167	9.836593	10.163407	3
29	9.752944	9.916080	9.836864	10.163136	3
30	9.753128	9.915994	9.837134	10.162866	3
	Co-ſine	Sine	Co-Tang.	Tangent	M

Degree 55.

Degree 34.

Sine	Co-ſine	Tangent	Co.Tang.	
9.753128	9.915991	9.837134	10.162866	30
9.753312	9.915907	9.837405	10.162595	29
9.753495	9.915820	9.837675	10.162325	28
9.753679	9.915733	9.837946	10.162054	27
9.753862	9.915646	9.838216	10.161784	26
9.754046	9.915559	9.838487	10.161513	25
9.754229	9.915472	9.838757	10.161243	24
9.754412	9.915385	9.839027	10.160973	23
9.754595	9.915297	9.839297	10.160702	22
9.754778	9.915210	9.839568	10.160432	21
9.754960	9.915123	9.839838	10.160162	20
9.755143	9.915035	9.840108	10.159892	19
9.755325	9.914948	9.840378	10.159622	18
9.755508	9.914860	9.840647	10.159352	17
9.755690	9.914773	9.840917	10.159083	16
9.755872	9.914685	9.841187	10.158813	15
9.756054	9.914597	9.841457	10.158543	14
9.756236	9.914510	9.841726	10.158273	13
9.756418	9.914422	9.841996	10.158004	12
9.756600	9.914334	9.842266	10.157734	11
9.756781	9.914246	9.842535	10.157465	10
9.756963	9.914158	9.842804	10.157195	9
9.757144	9.914070	9.843074	10.156926	8
9.757325	9.913982	9.843343	10.156657	7
9.757507	9.913894	9.843602	10.156387	6
9.757688	9.913806	9.843882	10.156118	5
9.757869	9.913718	9.844151	10.155849	4
9.758049	9.913630	9.844420	10.155580	3
9.758230	9.913542	9.844689	10.155311	2
9.758411	9.913453	9.844958	10.155042	1
9.758591	9.913364	9.845227	10.154774	0
Co ſine	Sine	Co.Tang.	Tangent.	M

Degree 55.

Degree 35.

M	Sine	Co-ſine	Tangent	Co Tang.
0	9.758591	9.913364	9.845227	10.154774
1	9.758772	9.913276	9.845496	10.154504
2	9.758952	9.913187	9.845764	10.154235
3	9.759132	9.913099	9.846033	10.153967
4	9.759312	9.913010	9.846302	10.153698
5	9.759492	9.912972	9.846570	10.153429
6	9.759672	9.912833	9.846839	10.153161
7	9.759851	9.912744	9.847107	10.152892
8	9.760031	9.912655	9.847376	10.152624
9	9.760210	9.912566	9.847644	10.152356
10	9.760390	9.912477	9.847913	10.152087
11	9.760569	9.912388	9.848181	10.151819
12	9.960748	9.912299	9.848449	10.151551
13	9.760927	9.912210	9.848717	10.151283
14	9.761106	9.912121	9.848985	10.151015
15	9.761285	9.912031	9.849254	10.150746
16	9.761464	9.911942	9.849522	10.150478
17	9.761642	9 911853	9.849789	10.150215
18	9.761821	9.911763	9.850057	10.149943
19	9.761999	9.911674	9.850325	10.149675
20	9.762177	9.911584	9.850593	10.149408
21	9.762456	9.911495	9.850861	10.149139
22	9.762534	9.911405	9.851128	10.148872
23	9.762712	9.911315	9.851396	10.148604
24	9.762889	9.911226	9.851664	10.148336
25	9.763067	9.911136	9.851931	10.148069
26	9.763245	9.911046	9.852199	10.147801
27	9.763422	9.910956	9.852466	10.147534
28	9.763599	9.910866	9.852701	10.147267
29	9.763777	9.910776	9.853001	10.146999
30	9.763954	9.910686	9.853268	10.141732
	Co-ſine	Sine	Co Tang.	Tangent

Degree 54.

Degree 35.

Sine	Co ſine	Tangent	Co Tang.	
9.763955	9.910686	9.853268	10.146732	30
9.764131	9.910596	9.853535	10.146465	29
9.764306	9.910506	9.853802	10.146198	28
9.764486	9.910415	9.854059	10.145931	27
9.764562	9.910325	9.854336	10.145664	26
9.764838	9.910235	9.854603	10.145397	25
9.765015	9.910144	9.854870	10.145130	24
9.765191	9.910054	9.855137	10.146863	23
9.765367	9.909963	9.855404	10.146596	22
9.765544	9.909873	9.855671	10.145329	21
9.765720	9.909782	9.855937	10.145063	20
9.765896	9.900144	9.856204	10.143796	19
9.766071	9.900054	9.856471	10.143529	18
9.766247	9.909963	9.856737	10.143263	17
9.766423	9.909873	9.857004	10.142996	16
9.766598	9.909782	9.857270	10.142730	15
9.766774	9.909237	9.857537	10.142463	14
9 766949	9.909145	9.857803	10.142197	13
9.767124	9.909055	9.858069	10.141931	12
9.767299	9.908954	9.858336	10.141664	11
9.767474	9.908873	9.858602	10.141398	10
9.767649	9.908781	9.858868	10.141132	9
9.767824	9.908690	9.859134	10.141165	8
9.767997	9.908599	9.859400	10 140600	7
9.768173	9.908509	9.859656	10.145334	6
9.768348	9.908416	9.859932	10.140068	5
9.768522	9.908324	9.860198	10.139802	4
9.768696	9.908233	9.860464	10.139536	3
9.768871	9.908141	9.860730	10.139270	2
9.769045	9.908049	9.860995	10.139005	1
9.769219	9.907958	9.861251	10.138739	0
Co-ſine	Sine	Co Tang	Tangent	M

Degree 54.

Degree 36.

M	Sine	Co-ſine	Tangent	Co-Tang.
0	9.769219	9.907958	9.861261	10.138739
1	9.769392	9.907866	9.861527	10.138473
2	9.769566	9.907774	9.861792	10.138208
3	9.769740	9.907682	9.862058	10.137942
4	9.769913	9.907590	9.862323	10.137677
5	9.770087	9.907498	9.862589	10.137411
6	9.770260	9.907406	9.862854	10.137146
7	9.770433	9.907314	9.863119	10.136880
8	9.770606	9.907221	9.863385	10.136615
9	9.770779	9.907129	9.863650	10.136350
10	9.770952	9.907027	9.863915	10.136085
11	9.771125	9.906945	9.864180	10.135820
12	9.771298	9.906852	9.864445	10.135554
13	9.771270	9.906760	9.864710	10.135289
14	9.771643	9.906667	9.864975	10.135024
15	9.771815	9.906574	9.865240	10.134759
16	9.771987	9.906482	9.865505	10.134495
17	9.772159	9.906389	9.865770	10.134230
18	9.772331	9.906296	9.866035	10.133965
19	9.772503	9.906203	9.866300	10.133700
20	9.772675	9.906111	9.866564	10.133436
21	9.772847	9.906018	9.866829	10.133171
22	9.773018	9.905925	9.867094	10.132906
23	9.773190	9.905832	9.867358	10.132642
24	9.773361	9.905738	9.867623	10.132377
25	9.773533	9.905645	9.867887	10.132113
26	9.773704	9.905552	9.868152	10.131848
27	9.773875	9.905459	9.868416	10.131584
28	9.774046	9.905365	9.868680	10.131320
29	9.774217	9.905272	9.868945	10.131055
30	9.774388	9.905179	9.869209	10.130791
	Co ſine	Sine	Co-Tang.	Tangent

Degree 53.

Degree 36.

M	Sine	Co-ſine	Tangent	Co Tang.	
30	9.774388	9.905179	9.869209	10.130791	30
31	9.774558	9.905085	9.869773	10.130527	29
32	9.774729	9.904952	9.869337	10.130263	28
33	9.774899	9.904898	9.870001	10.129999	27
34	9.775070	9.904804	9.870265	10.129735	26
35	9.775240	9.904711	9.870529	10.129471	25
36	9.775410	9.904617	9.870793	10.129207	24
37	9.775580	9.904523	9.871057	10.128943	23
38	9.775750	9.904429	9.871321	10.128679	22
39	9.775920	9.904335	9.871585	10.128415	21
40	9.776090	9.904241	9.871849	10.128151	20
41	9.776259	9.904147	9.872112	10.127888	19
42	9.776429	9.904053	9.872316	10.127624	18
43	9.776598	9.903959	9.872640	10.127360	17
44	9.776763	9.903864	9.872903	10.127097	16
45	9.776837	9.903770	9.873167	10.126835	15
46	9.777106	9.903676	9.873450	10.126570	14
47	9.777275	9.903581	9.873694	10.126306	13
48	9.777444	9.903485	9.873957	10.126043	12
49	9.777613	9.903392	9.874220	10.125780	11
50	9.777781	9.903298	9.874481	10.125516	10
51	9.777950	9.903203	9.874747	10.125253	9
52	9.778119	9.903108	9.875010	10.124990	8
53	9.778287	9.903013	9.875273	10.124727	7
54	9.778455	9.902919	9.875536	10.124464	6
55	9.778623	9.902324	9.875799	10.124201	5
56	9.778792	9.902729	9.876063	10.123937	4
57	9.778960	9.902634	9.876326	10.123674	3
58	9.779129	9.902539	9.876589	10.123411	2
59	9.779295	9.902444	9.876851	10.123149	1
60	9.779463	9.902349	9.877114	10.122885	0
	Co-ſine	Sine	Co Tang	Tangent	M

Degree 53.

Degree 37.

M	Sine	Co ſine	Tangent	Co-Tang.	
0	9.779463	9.902349	9.877114	10.122885	60
1	9.779631	9.902254	9.877377	10.122623	59
2	9.779798	9.902158	9.877640	10.122360	58
3	9.779965	9.902063	9.877903	10.122097	57
4	9.780133	9.901967	9.878165	10.121834	56
5	9.780300	9.901872	9.878428	10.12157[illegible]	55
6	9.780467	9.901776	9.878591	10.121309	54
7	9.780634	9.901681	9.878953	10.121047	53
8	9.780801	9.901585	9.879216	10.120784	52
9	9.780958	9.901488	9.879478	10.120522	51
10	9.781134	9.901391	9.879741	10.120259	50
11	9.781301	9.901298	9.880003	10.119997	49
12	9.781467	9.901202	9.880265	10.119734	48
13	9.781694	9.901106	9.880528	10.119472	47
14	9.781800	9.901010	9.880790	10.119210	46
15	9.781966	9.900914	9.881052	10.118948	45
16	9.782132	9.900828	9.881314	10.118686	44
17	9.782298	9.900722	9.881576	10.118424	43
18	9.782464	9.900626	9.881839	10.118161	42
19	9.782690	9.900529	9.882101	10.117899	41
20	9.782796	9.900433	9.882363	10.117637	40
21	9.782961	9.900337	9.882625	10.117375	39
22	9.783127	9.900240	9.882886	10.117114	38
23	9.783292	9.900144	9.883148	10.116852	37
24	9.783457	9.900047	9.883410	10.116590	36
25	9.783623	9.899951	9.883672	10.116328	35
26	9.783788	9.899854	9.883934	10.116066	34
27	9.783953	9.899757	9.884195	10.115805	33
28	9.784118	9.899660	9.884457	10.115543	32
29	9.784282	9.899563	9.884719	10.115281	31
30	9.784447	9.899467	9.884980	10.115020	30
	Co-ſine	Siue	Co-Tang	Tangent.	I

Degree 52.

Degree 37.

	Sine	*Co-sine*	Tangent	*Co Tang.*	
	9.784147	9.899457	9.884980	10.115020	30
	9.784616	9.899370	9.885242	10.114758	29
	9.784775	9.899273	9.885503	10.114497	28
	9.784941	9.899175	9.885765	10.114235	27
	9.785105	9.899078	9.885025	10.113974	26
	9.785269	9.898981	9.886283	10.113712	25
	9.785433	9.898884	9.886549	10.113451	24
	9.785591	9.898787	9.886810	10.113190	23
	9.785761	9.898689	9.887072	10.112028	22
	9.785925	9.898592	9.887333	10.112667	21
	9.786088	9.898494	9.887594	10.112405	20
	9.786252	9.898397	9.887855	10.112145	19
	9.785416	9.898299	9.888116	10.111884	18
	9.786579	9.898201	9.888377	10.111623	17
	9.786742	9.898104	9.888638	10.111362	16
45	9.786909	9.898006	9.888899	10.111101	15
46	9.787069	9.897908	9.889160	10.110840	14
47	9.787232	9.897810	9.889421	10.110579	13
48	9.787395	9.897712	9.889682	10.110318	12
49	9.787557	9.897614	9.889943	10.110057	11
50	9.787720	9.897515	9.890204	10.109795	10
51	9.787883	9.897418	9.890465	10.109535	9
52	9.788045	9.897320	9.890725	10.109275	8
53	9.788208	9.897222	9.890986	10.109014	7
54	9.788370	9.897123	9.891247	10.108753	6
55	9.788532	9.897025	9.891507	10.108493	5
56	9.788694	9.896925	9.891768	10.108232	4
57	9.788855	9.896828	9.892028	10.107972	3
58	9.789018	9.896729	9.892289	10.107711	2
59	9.789180	9.896631	9.892549	10.107451	1
60	9.789342	9.896532	9.892810	10.107190	0
	Co sine	Sine	*Co.Tang.*	Tangent.	M

Degree 52.

Degree 38.

M	Sine	Co ſine	Tangent	Co-Tang.	
0	9.789342	9.896532	9.892810	10.107190	60
1	9.789504	9.896433	9.893070	10.106930	59
2	9.789665	9.896335	9.893330	10.106669	58
3	9.789827	9.896236	9.893591	10.106409	57
4	9.789988	9.896137	9.893851	10.106149	56
5	9.790149	9.896038	9.894111	10.105889	55
6	9.790310	9.895939	9.894371	10.105629	54
7	9.790471	9.895840	9.894632	10.105368	53
8	9.790632	9.895741	9.894892	10.105108	52
9	9.790793	9.895641	9.895152	10.104848	51
10	9.790954	9.895542	9.895412	10.104588	50
11	9.791115	9.895443	9.895672	10.104328	49
12	9.791275	9.895343	9.895932	10.104068	48
13	9.791436	9.895244	9.896192	10.103808	47
14	9.791596	9.895144	9.896452	10.103548	46
15	9.791756	9.895045	9.896712	10.103288	45
16	9.791917	9.894945	9.896971	10.103029	44
17	9.792077	9.894846	9.897231	10.102769	43
18	9.792237	9.894746	9.897491	10.102509	42
19	9.792397	9.894646	9.897751	10.102249	41
20	9.792557	9.894546	9.898010	10.101990	40
21	9.792716	9.894446	9.898270	10.101730	39
22	9.792876	9.894346	9.898530	10.101470	38
23	9.793035	9.894245	9.898789	10.101211	37
24	9.793195	9.894146	9.899049	10.100951	36
25	9.793354	9.884046	9.899308	10.100692	35
26	9.793513	9.893946	9.899568	10.100432	34
27	9.793673	9.893845	9.899827	10.100173	33
28	9.793832	9.893745	9.900085	10.099913	32
29	9.793991	9.893645	9.900346	10.099654	31
30	9.794149	9.893544	9.900605	10.099395	30
	Co-ſine	Sine	Co-Tang	Tangent.	M

Degree 51.

Degree 38.

M	Sine	Co ſine	Tangent	Co-Tang.	
30	9.794149	9.893544	9.900605	10.099395	30
31	9.794308	9.893444	9.900864	10.099135	29
32	9.794467	9.893343	9.901124	10.098876	28
33	9.794626	9.893243	9.901383	10.098617	27
34	9.794784	9.893142	9.901642	10.098358	26
35	9.794942	9.893041	9.901901	10.098099	25
36	9.795101	9.892940	9.902160	10.097839	24
37	9.795259	9.892839	9.902419	10.097580	23
38	9.795417	9.892738	9.902678	10.097321	22
39	9.795575	9.892637	9.902937	10.097062	21
40	9.795733	9.892536	9.903196	10.096803	20
41	9.795891	9.892455	9.903455	10.096544	19
42	9.796049	9.892334	9.903714	10.096285	18
43	9.796206	9.892973	9.903973	10.096027	17
44	9.796364	9.892232	9.904232	10.095768	16
45	9.796521	9.892491	9.904491	10.095509	15
46	9.796678	9.891929	9.904750	10.095250	14
47	9.796836	9.891827	9.905008	10.094991	13
48	9.796993	9.891726	9.905267	10.094733	12
49	9.797150	9.891624	9.905526	10.094474	11
50	9.797307	9.891522	9.905784	10.094215	10
51	9.797464	9.891421	6.906043	10.093957	9
52	9.797621	9.891310	9.906302	10.093698	8
53	9.797777	9.891217	9.906560	10.093440	7
54	9.797934	9.891115	9.906819	10.093181	6
55	9.798091	9.891013	9.907077	10.092923	5
56	9.798247	9.890911	9.907336	10.092664	4
57	9.798403	9.890809	9.907594	10.092406	3
58	9.798560	9.890707	9.907852	10.092147	2
59	9.798716	9.890605	9.908111	10.091889	1
60	9.798872	9.890503	9.908369	10.091631	0
	Co-ſine	Sine	Co-Tang.	Tangent.	M

Degree 51.

Degree 39.

M	Sine	Co ſine	Tangent	Co-Tang.	
0	9.798872	9.890503	9.908369	10.091631	60
1	9.799028	9.890400	9.908627	10.091373	59
2	9.799184	9.890298	9.908886	10.091114	58
3	9.799339	9.890195	9.909144	10.090856	57
4	9.799495	9.890093	9.909402	10.090598	56
5	9.799651	9.889990	9.909600	10.090340	55
6	9.799806	9.889888	9.909918	10.090081	54
7	9.799961	9.889785	9.910176	10.089823	53
8	9.800117	9.889682	9.910435	10.089565	52
9	9.800272	9.889579	9.910593	10.089307	51
10	9.800427	9.889476	9.910951	10.089049	50
11	9.800582	9.889374	9.911209	10.088791	49
12	9.800737	9.889271	9.911467	10.083533	48
13	9.800892	9.889167	9.911724	10.088276	47
14	9.801047	9.889064	9.911982	10.088017	46
15	9.801201	9.888961	9.912240	10.087760	45
16	9.801356	9.888858	9.912498	10.087502	44
17	9.801510	9.888755	9.912756	10.087244	43
18	9.801665	9.888651	9.913014	10.085985	42
19	9.801819	9.888548	9.913271	10.085729	41
20	9.801973	9.888444	9.913529	10.085471	40
21	9.802127	9.888341	9.913787	10.086213	39
22	9.802282	9.888237	9.914044	10.085956	38
23	9.802435	9.888133	9.914302	10.085698	37
24	9.802589	9.888030	9.914560	10.085440	36
25	9.802743	9.887926	9.914817	10.085183	35
26	9.802897	9.887822	9.915075	10.084925	34
27	9.803050	9.887718	9.915332	10.084668	33
28	9.803204	9.887614	9.915590	10.084410	32
29	9.803457	9.887510	9.915847	10.084153	31
30	9.803510	9.887405	9.916104	10.083895	30
	Co-ſine	Sine	Co-Tang.	Tangent.	M

Degree 50.

Degree 39.

M	Sine	*Co-ſine*	Tangent	*Co.Tang.*	
30	9.803510	9 887406	9.916104	10.083895	30
31	9.803664	9.887302	9.916362	10.083638	29
32	9.803817	9.887198	9.916619	10.083381	28
33	9.803970	9.887093	9.916876	10.083123	27
34	9.804123	9.886989	9.917134	10.082866	26
35	9.804276	9.886884	9.917391	10.082609	25
36	9.804428	9.886780	9.917648	10.082352	24
37	9.804581	9.886675	9.917905	10.082094	23
38	9.804734	9.886571	9.918162	10.081837	22
39	9.804886	9.686466	9.918420	10.081580	21
40	9.805038	9.886361	9.918677	10.081323	20
41	9.805191	9.886257	9.918934	10.080066	19
42	9.805343	9.885152	9.919191	10.080809	18
43	9.805495	9.885047	9.919448	10.080552	17
44	9.805647	9.885942	9.919705	10.080295	16
45	9.805799	9.885837	9.919962	10.080038	15
46	9.805951	9.885732	9.920219	10.079781	14
47	9.806103	9.885627	9.920476	10.079524	13
48	9.806254	9.885521	9.920733	10.079267	12
49	9.806405	9.885416	9.920990	10.079010	11
50	9.806557	9.885311	9.921247	10.078753	10
51	9.806709	9.885205	9.921503	10.078495	9
52	9.806860	9.885100	9.921760	10.078240	8
53	9.807011	9.884994	9.922017	10.077983	7
54	9.807162	9.884889	9.922274	10.077725	6
55	9.807313	9.884783	9.922530	10.077469	5
56	9.807464	9.884677	9.922787	10.077213	4
57	9.807615	9.884572	9.923044	10.076956	3
58	9.807766	9.884466	9.923300	10.076699	2
59	9.807917	9.884360	9.923557	10.076443	1
60	9.808067	9.884254	9.923813	10.076186	0
	Co ſine	Sine	*Co.Tang.*	Tangent.	M

Degree 50.

Degree 40.

M	Sine	*Co-ſine*	Tangent	*Co.Tang.*	
0	9.808067	9.884254	9.923813	10.076186	60
1	9.808218	9.884148	9.924070	10.075930	59
2	9.808368	9.884042	9.924327	10.075673	58
3	9.808519	9.883936	9.924583	10.075417	57
4	9.808669	9.883829	9.924839	10.075160	56
5	9.808819	9.883723	9.925095	10.074904	55
6	9.808969	9.883617	9.925352	10.074647	54
7	9.809119	9.883510	9.925609	10.074391	53
8	9.809269	9.883404	9.925865	10.074135	52
9	9.809419	9.883297	9.926121	10.073878	51
10	9.809569	9.883191	9.926378	10.073622	50
11	9.809718	9.883084	9.926634	10.073366	49
12	9.809868	9.882977	9.926890	10.073110	48
13	9.810017	9.882871	9.927147	10.072853	47
14	9.810166	9.882764	9.927403	10.072597	46
15	9.810316	9.882657	9.927659	10.072341	45
16	9.810465	9.882550	9.927915	10.072085	44
17	9.890614	9.882443	9.928171	10.071829	43
18	9.810763	9.882336	9.928427	10.071573	42
19	9.810912	9.882228	9.928683	10.071316	41
20	9.811061	9.882121	9.928940	10.071060	40
21	9.811210	9.882014	9.929196	10.070804	39
22	9.811358	9.881907	9.929452	10.070548	38
23	9.811506	9.831799	9.929708	10.070292	37
24	9.811655	9.881692	9.929964	10.070036	36
25	9.811804	9.881584	9.930219	10.069781	35
26	9.811952	9.881477	9.930475	10.069525	34
27	9.812100	9.881369	9.930731	10.069269	33
28	9.812248	9.881261	9.930987	10.069013	32
29	9.812396	9.881153	9.931243	10.068757	31
30	9.812544	9.881045	9.931499	10.068501	30
	Co ſine	Sine	*Co.Tang.*	Tangent.	M

Degree 49.

Degree 40.

M	Sine	Co-ſine	Tangent	Co-Tang.	
30	9.812544	9.881045	9.931499	10.068501	30
31	9.812692	9.880939	9.931755	10.068245	29
32	9.812840	9.880827	9.932010	10.067989	28
33	9.812988	9.880722	9.932266	10.067734	27
34	9.813135	9.880513	9.932522	10.067478	26
35	9.813283	9.880505	9.932778	10.067222	25
36	9.813430	9.880397	9.933033	10.066967	24
37	9.813578	9.880289	9.933289	10.066711	23
38	9.813725	9.880180	9.933545	10.066455	22
39	9.813872	9.880072	9.933800	10.066200	21
40	9.814019	9.887963	9.934050	10.065944	20
41	9.814166	9.879855	9.934311	10.065683	19
42	9.814313	9.879745	9.934567	10.065433	18
43	9.814460	9.879637	9.934822	10.065177	17
44	9.814607	9.879529	9.935078	10.064622	16
45	9.814753	9.879420	9.935333	10.054656	15
46	9.814900	9.879310	9.935589	10.064411	14
47	9.815046	9.879202	9.935844	10.064155	13
48	9.815193	9.879093	9.936100	10.064900	12
49	9.815339	9.878984	9.936355	10.063645	11
50	9.815485	9.878875	9.936610	10.063389	10
51	9.815631	9.878766	9.936866	10.063134	9
52	9.815777	9.878656	9.937121	10.062879	8
53	9.815923	9.878547	9.937376	10.052673	7
54	9.816069	9.878438	9.937632	10.062365	6
55	9.816215	9.878328	9.937887	10.062113	5
56	9.816361	9.878219	9.938142	10.061858	4
57	9.816506	9.878127	9.938397	10.051602	3
58	9.816652	9.877990	9.938653	10.061347	2
59	9.816797	9.877880	9.938908	10.060092	1
60	9.816943	9.877780	9.939163	10.060837	0
	Co-ſine	Sine	Co-Tang.	Tangent	M

Degree 49.

Degree 41.

M	Sine	Co-ſine	Tangent	Co-Tang.	
0	9.816943	9.877780	9.939163	10.060837	60
1	9.817088	9.877670	9.939418	10.060582	59
2	9.817233	9.877560	9.939673	10.060327	58
3	9.817378	9.877450	9.939928	10.060072	57
4	9.817528	9.877340	9.940183	10.059816	56
5	9.817668	9.877230	9.940438	10.059562	55
6	9.817813	9.877120	9.940693	10.059307	54
7	9.817958	9.877009	9.940948	10.059052	53
8	9.818103	9.876899	9.941203	10.058797	52
9	9.818247	9.876789	9.941458	10.058542	51
10	9.818492	9.876678	9.941713	10.058287	50
11	9.818536	9.876568	9.941968	10.058032	49
12	9.818681	9.876457	9.942223	10.057777	48
13	9.818825	9.876347	9.942478	10.057522	47
14	9.818969	9.876236	9.942733	10.057257	46
15	9.819113	9.876125	9.942983	10.057012	45
16	9.819257	9.876014	9.943243	10.056757	44
17	9.819451	9.875904	9.943498	10.056502	43
18	9.819545	9.875793	9.943752	10.056248	42
19	9.819689	9.875682	9.944097	10.055993	41
20	9.819832	9.875571	9.944262	10.055738	40
21	9.819976	9.875459	9.944517	10.055483	39
22	9.820119	9.875348	9.944771	10.055229	38
23	9.820263	9.875237	9.945026	10.054974	37
24	9.820406	9.875125	9.945281	10.054719	36
25	9.820549	9.875004	9.945535	10.054464	35
25	9.820693	9.874903	9.945790	10.054210	34
27	9.820835	9.874791	9.946045	10.053055	33
28	9.820979	9.874679	9.946299	10.053701	32
29	9.821122	9.874568	9.946554	10.053446	31
30	9.821264	9.874450	9.946808	10.053192	30
	Co ſine	Sine	Co-Tang.	Tangent	M

Degree 48.

Degree 41.

M	Sine	*Co-ſine*	Tangent	*Co Tang.*	
30	9.821254	9.874456	9.946808	10.053192	30
31	9.821407	9.874367	9.947063	10.052937	29
32	9.821550	9.874210	9.947317	10.052682	28
33	9.821692	9.874172	9.947572	10.092428	27
34	9.821835	9.874008	9.947826	10.052173	26
35	9.821977	9.873896	9.948081	10.051919	25
36	9.822120	9.873784	9.948335	10.051664	24
37	9.822262	9.873672	9.948590	10.051410	23
38	9.822404	9.873560	9.948844	10.051156	22
39	9.822546	9.873447	9.949099	10.050901	21
40	9.822683	9.873335	9.949353	10.050647	20
41	9.822830	9.873223	9.949607	10.050393	19
42	9.822972	9.873110	9.949852	10.050135	18
43	9.823114	9.872998	9.950116	10.049884	17
44	9.823255	9.872885	9.950370	10.049630	16
45	9.823397	9.872772	9.950625	10.049375	15
46	9.823538	9.872559	9.950879	10.049121	14
47	9.823680	9.872540	9.951233	10.048867	13
48	9.823821	9.872434	9.951358	10.048612	12
49	9.823962	9.872321	9.951642	10.048358	11
50	9.824104	9.872208	9.951895	10.048104	10
51	9.824245	9.872094	9.952150	10.047850	9
52	9.824386	9.871981	9.952404	10.047575	8
53	9.824527	9.871868	9.952659	10.047341	7
54	9.824667	9.871755	9.952915	10.047387	6
55	9.824808	9.871641	9.953167	10.046833	5
56	9.824949	9.871538	9.953421	10.046579	4
57	9.825070	9.871414	9.953675	10.046325	3
58	9.825230	9.871301	9.953929	10.046071	2
59	9.825370	9.871187	9.954183	10.045817	1
60	9.825511	9.871070	9.954437	10.045562	0
	Co-ſine	Sine	*Co-Tang.*	Tangent	M

Degree 48.

Degree 42.

M	Sine	Co-sine	Tangent	Co-Tang.	
0	9.825511	9.871073	9.954437	10.045562	60
1	9.825651	9.870960	9.954691	10.045308	59
2	9.825791	9.870846	9.954945	10.045054	58
3	9.825931	9.870732	9.955199	10.044800	57
4	9.826071	9.870918	9.955453	10.044546	56
5	9.826211	9.870504	9.955707	10.044292	55
6	9.826351	9.870390	9.955961	10.044038	54
7	9.826491	9.870175	9.956215	10.043784	53
8	9.826631	9.870161	9.955469	10.043531	52
9	9.826770	9.870047	9.956723	10.043276	51
10	9.826930	9.869933	9.956977	10.043023	50
11	9.827049	9.869818	9.957231	10.042769	49
12	9.827189	9.869704	9.957485	10.042515	48
13	9.827328	9.869589	9.957739	10.042261	47
14	9.827467	9.869474	9.957993	10.042007	46
15	9.827606	9.859360	9.958245	10.041753	45
16	9.827745	9.869245	9.958500	10.041500	44
17	9.827884	9.869130	9.958754	10.041246	43
18	9.828 23	9.869015	9.959008	10.040992	42
19	9.828162	9.868900	9.959262	10.040738	41
20	9.828301	9.868785	9.959515	10.040485	40
21	9.828439	9.868670	9.959769	10.040231	39
22	9.828578	9.868555	9.960023	10.039977	38
23	9.828716	9.868429	9.960277	10.039723	37
24	9.828855	9.868324	9.960530	10.039469	36
25	9.828993	9.868209	9.960784	10.039216	35
26	9.829131	9.858092	9.961038	10.038962	34
27	9.829269	9.867978	9.961291	10.038708	33
28	9.829407	9.867862	9.961545	10.038455	32
29	9.829545	9.867747	9.961799	10.038201	31
30	9.829683	9.867631	9.962052	10.037947	30
	Co-sine	Sine	Co-Tang.	Tangent	M

Degree 47.

Degree 42.

M	Sine	Co-ſine	Tangent	Co-Tang.	
30	9.829683	9.867631	9.962052	10.037947	30
31	9.829821	9.867515	9.962305	10.037694	29
32	9.829959	9.897399	9.962560	10.037140	28
33	9.830096	9.867283	9.962813	10.037187	27
34	9.830234	9.867167	9.963067	10.036933	26
35	9.830372	9.867051	9.963320	10.036680	25
36	9.830509	9.866935	9.963574	10.036426	24
37	9.830546	9.866819	9.963827	10.036173	23
38	9.830784	9.865703	9.964081	10.035910	22
39	9.830921	9.866586	9.964335	10.035665	21
40	9.831058	9.866470	9.964588	10.035412	20
41	9.831195	9.866353	9.964842	10.035158	19
42	9.831332	9.866237	9.965095	10.034905	18
43	9.831469	9.866120	9.965348	10.034552	17
44	9.831605	9.866004	9.965602	10.034398	16
45	9.831742	9.865887	9.965855	10.034144	15
46	9.831879	9.865770	9.966109	10.033891	14
47	9.832015	9.865653	9.966362	10.033638	13
48	9.832152	9.865536	9.966616	10.033384	12
49	9.832288	9.865419	9.966869	10.033131	11
50	9.832425	9.865302	9.967122	10.032878	10
51	9.832;61	9.865185	9.967376	10.032624	9
52	9.832697	9.865068	9.967629	10.032371	8
53	9.832833	9.864950	9.967883	10.032117	7
54	9.832969	9.864833	9.968136	10.031864	6
55	9.833105	9.864716	9.968389	10.031611	5
56	9.833241	9.864598	9.958643	10.031357	4
57	9.833376	9.864480	9.968896	10.031104	3
58	9.833512	9.864363	9.969149	10.030851	2
59	9.833648	9.864240	9.959403	10.030597	1
60	9.833783	9.854127	9.969656	10.030344	0
	Co ſine	Sine	Co-Tang	Tangent.	M

Degree 47.

Degree 43.

M	Sine	Co-ſine	Tangent	Co-Tang.	
0	9.823783	9.864127	9.969656	10.030344	60
1	9.833919	9.864010	9.969909	10.030091	59
2	9.834054	9.863892	9.970162	10.029838	58
3	9.834189	9.863774	9.970416	10.029584	57
4	9.834324	9.863656	9.970669	10.029331	56
5	9.834460	9.863537	9.970922	10.029078	55
6	9.834595	9.863419	9.971175	10.028825	54
7	9.834730	9.863301	9.971428	10.028572	53
8	9.834865	9.863183	9.971682	10.028318	52
9	9.834999	9.863064	9.971935	10.028065	51
10	9.835134	9.862946	9.972188	10.027812	50
11	9.835269	9.862827	9.972441	10.027559	49
12	9.835403	9.862709	9.972694	10.027306	48
13	9.835538	9.862590	9.972948	10.027052	47
14	9.835672	9.862471	9.973201	10.026799	46
15	9.835806	9.862353	9.973454	10.026546	45
16	9.835941	9.862234	9.973707	10.026293	44
17	9.836075	9.862115	9.973960	10.026040	43
18	9.836209	9.861996	9.974213	10.025787	42
19	9.836343	9.861877	9.974466	10.025533	41
20	9.836477	9.861757	9.974719	10.025280	40
21	9.836611	9.861638	9.974973	10.025027	39
22	9.836745	9.861519	9.975226	10.024774	38
23	9.836878	9.861399	9.975479	10.024521	37
24	9.837012	9.861280	9.975732	10.024268	36
25	9.837146	9.861161	9.975985	10.024015	35
26	9.837279	9.861041	9.976238	10.023762	34
27	9.837412	9.860921	9.976491	10.023509	33
28	9.837546	9.860802	9.976744	10.023256	32
29	9.837679	9.860682	9.976997	10.023003	31
30	9.837812	9.860562	9.977250	10.022750	30
	Co ſine	Sine	Co-Tang	Tangent.	M

Degree 46.

Degree 43.

M	Sine	*Co-ſine*	Tangent	*Co Tang.*	
30	9.837812	9.860562	9.977250	10.022750	30
31	9.837945	9.860442	9.977503	10.022497	29
32	9.838078	9.860322	9.977756	10.022244	28
33	9.838211	9.860202	9.978009	10.021991	27
34	9.838344	9.860082	9.978262	10.021738	26
35	9.838477	9.859962	9.978515	10.021485	25
36	9.838609	9.859842	9.978768	10.021232	24
37	9.838742	9.859721	9.979021	10.020979	23
38	9.838875	9.859601	9.979274	10.020726	22
39	9.839007	9.859480	9.979527	10.020473	21
40	9.839140	9.859360	9.979780	10.020220	20
41	9.839272	9.859239	9.980033	10.019967	19
42	9.839404	9.859118	9.980235	10.019714	18
43	9.839536	9.858998	9.980538	10.019461	17
44	9.839668	9.858877	9.980791	10.019209	16
45	9.839800	9.858756	9.981044	10.010956	15
46	9.839932	9.858635	9.981297	10.018703	14
47	9 840064	9.858514	9.981550	10.018450	13
48	9.840195	9.858193	9.981803	10.018197	12
49	9.840328	9.858272	9.982056	10.017944	11
50	9.840459	9.858150	9.982309	10.017691	10
51	9.840591	9.858029	9.982562	10.017438	9
52	9.840722	9.857908	9.982814	10.017185	8
53	9.840854	9.857786	9.983067	10 016933	7
54	9.840985	9.857665	9.983320	10.016680	6
55	9.841116	9.857543	9.983573	10.016427	5
56	9.841247	9.857421	9.983826	10.016174	4
57	9.841378	9.857300	9.984079	10.016921	3
58	9.841509	9.857178	9.984331	10.015668	2
59	9.841640	9.857056	9.984584	10.015416	1
60	9.841771	9.856954	9.984837	10.015163	0
	Co-ſine	Sine	*Co Tang.*	Tangent	.

Degree 46.

Degree 44.

M	Sine	Co ſine	Tangent	Co-Tang.	
0	9.841771	9.856934	9.984837	10.015162	60
1	9.841902	9.856812	9.985090	10.014910	59
2	9.842033	9.856690	9.985343	10.014657	58
3	9.842163	9.856568	9.985596	10.015404	57
4	9.842294	9.856445	9.985848	10.014151	56
5	9.842924	9.856323	9.986101	10.013899	55
6	9.842555	9.856201	9.986354	10.013646	54
7	9.842685	9.856078	9.986607	10.013393	53
8	9.842815	9.855956	9.986859	10.013140	52
9	9.842945	9.855833	9.987112	10.012888	51
10	9.843076	9.855710	9.987365	10.012635	50
11	9.843206	9.855588	9.987618	10.012382	49
12	9.843336	9.855465	9.987871	10.012129	48
13	9.843465	9.855342	9.988123	10.011877	47
14	9.843595	9.855219	9.988376	10.011624	46
15	9.843725	9.855096	9.988629	10.011371	45
16	9.843855	9.854973	9.988882	10.011118	44
17	9.843984	9.854850	9.989134	10.010866	43
18	9.844114	9.854727	9.989387	10.010613	42
19	9.844243	9.854603	9.989640	10.010360	41
20	9.844372	9.854480	9.989893	10.010107	40
21	9.844502	9.854356	9.990145	10.009855	39
22	9.844631	9.854233	9.990398	10.009602	38
23	9.844760	9.854109	9.990651	10.009349	37
24	9.844889	9.853986	9.990903	10.009096	36
25	9.845018	9.853862	9.991156	10.008844	35
26	9.845147	9.853738	9.991409	10.008591	34
27	9.845276	9.853614	9.991662	10.008338	33
28	9.845404	9.853490	9.991914	10.008086	32
29	9.845533	9.853366	9.992167	10.007833	31
30	9.845662	9.853242	9.992420	10.007580	30
	Co-ſine	Sine	Co-Tang.	Tangent.	M

Degree 45.

Degree 44.

M	Sine	Co-ſine	Tangent	Co-Tang.	
30	9.845662	9.853242	9.992420	10.007580	30
31	9.845790	9.853113	9.992672	10.007328	29
32	9.845919	9.852994	9.992925	10.007075	28
33	9.846047	9.852869	9.993178	10.006822	27
34	9.846175	9.852745	9.993430	10.006569	26
35	9.846304	9.852620	9.993683	10.006317	25
36	9.846432	9.852496	9.993935	10.006064	24
37	9.846550	9.852371	9.994189	10.005811	23
38	9.846688	9.852246	9.994442	10.005559	22
39	9.846816	9.852122	9.994691	10.005305	21
40	9.846944	9.851997	9.994947	10.005053	20
41	9.847071	9.851872	9.995199	10.004801	19
42	9.847199	9.851747	9.995452	10.004548	18
43	9.847327	9.851622	9.995705	10.004295	17
44	9.847454	9.851497	9.995957	10.004043	16
45	9.847582	9.851372	9.996210	10.003790	15
46	9.847709	9.851246	9.996463	10.003537	14
47	9.847836	9.851121	9.996715	10.003285	13
48	9.847964	9.850996	9.996968	10.003032	12
49	9.848091	9.850870	9.997220	10.002779	11
50	9.848218	9.850745	9.997473	10.002527	10
51	9.848345	9.850619	9.997726	10.002274	9
52	9.848472	9.850493	9.997979	10.002021	8
53	9.848599	9.850367	9.998231	10.001769	7
54	9.848726	9.850242	9.998484	10.001516	6
55	9.848852	9.850116	9.998737	10.001263	5
56	9.848979	9.849990	9.998989	10.001011	4
57	9.849106	9.849864	9.999242	10.000758	3
58	9.849132	9.849737	9.999495	10.000505	2
59	9.849359	9.849611	9.999747	10.000253	1
60	9.849485	9.849185	10.00000	10.000000	0
	Co ſine	Sine	Co Tang	Tangent.	M

Degree 45.

A moſt uſeful Table, *whereby the true time of the Night may be known to a minute, without knowing the Meridian, Height, or Diſtance of the* ✳.

Stars names that never ſet, and will be under the Pole Star.	righh aſc. in time under the Pole ✳	d. in t· bet. the pole ✳ & pol:	Azimuth under Pole ✳	From Meri.	Magnitude
	h ′ ″	′ ″	° ′ ″		
1 Caſſiopeias hip-	12.38.01	00.07	00.01.00	E	3
2 - - her knee - -	13.08.33	03.25	00.30.30	E	3
3 In Perſeus ſide -	15.15.39	14.40	02.21.30	E	2
4 Great Bears lip	20.13.11	09.19	01.43.20	E	4
5 In his left knee	21.16.04	11.59	01.51.30	E	3
6 Lower leader -	22.53.21	11.08	01.33.40	E	2
7 Upper i'th' wain	22.55.42	12.07	01.29.30	E	2
8 The lower in ☐	23.42.52	06.26	00.57.00	E	2
9 The upper - - -	00.10.33	02.05	00.35.20	E	2
10 Rump or Aliot	00.39.18	00.18	00.02.30	W	2
11 Laſt but one tayl	01.07.09	03.40	00.25.00	W	2
12 Laſt of the tayl	01.29.05	05.40	00.55.00	W	2
13 Laſt turn of Dr.	01.48.12	10.52	01.14.40	W	2
14 Upper guard l.B.	02.24.32	26.05	02.07.50	W	2
15 Lower of lit. B	02.58.42	26.38	02.22.10	W	3
16 Br. ✳ Drag. hea.	05.25.26	43.17	03.42.44	W	2
17 Upp. turn of D.	06.38.11	34.54	03.51.20	W	3
18 Cepheus left ſho.	08.43.06	27.20	03.10.20	W	2
19 In his Girdle -	08.55.04	24.43	03.04.40	W	3
20 Right knee - -	11.10.02	17.30	01.21.40	W	3
21 Caſſiopeas chair	11.41.37	10.21	00.48.20	W	3
22 In her breaſt - -	12.20.56	01.32	00.15.20	W	3

A Table of the Suns Right Aſcenſion in Time.

	♈	♎	Com.		♉	♏	Com.	
	H	H	parts ′ ″	diff. ″	H	H	parts ′ ″	diff. ′
1	0	11	3.40	222	1	13	55.25	230
2	0	12	7.20	220	1	13	59.15	231
3	0	12	11.10	220	2	14	3.06	231
4	0	12	14.40	220	2	14	6.57	232
5	0	12	18.20	220	2	14	10.49	233
6	0	12	22.00	220	2	14	14.42	233
7	0	12	25.41	221	2	14	88.35	234
8	0	12	29.22	221	2	14	22.29	234
9	0	12	33.03	221	2	14	26.23	235
10	0	12	36.14	221	2	14	30.18	236
11	0	12	40.25	222	2	14	34.14	237
12	0	12	44.07	222	2	14	38.11	237
13	0	12	47.49	222	2	14	42.08	238
14	0	12	51.31	222	2	14	46.06	239
15	0	12	55.13	223	2	14	50.05	239
16	0	12	58.56		2	14	54.04	
17	1	13	2.39	223	2	14	58.05	241
18	1	13	6.22	223	3	15	2.06	241
19	1	13	10.06	224	3	15	6.07	241
20	1	13	13.50	224	3	15	10.10	243
21	1	13	17.34	224	3	15	14.13	243
22	1	13	21.19	225	3	15	18.17	244
23	1	13	25.04	225	3	15	22.21	244
24	1	13	28.50	226	3	15	26.25	245
25	1	13	32.36	226	3	15	30.32	246
25	1	13	36.23	227	3	15	34.39	247
27	1	13	40.10	227	3	15	38.47	248
28	1	13	43.58	228	3	15	42.55	248
29	1	13	47.47	229	3	15	47.04	249
30	1	13	51.36	229	3	15	51.13	249

A Table of the Suns Right Aſcenſion in Time.

	♊ H	♐ H	Com parts ′ ″	diff. ′	♋	♑	Com parts ′ ″	diff. ′
1	3	15	55.24	251	6	18	4.22	262
2	3	15	59.35	252	6	18	8.43	262
3	4	16	3.46	250	6	18	13.05	252
4	4	16	7.58	253	6	18	17.27	261
5	4	16	12.11	253	6	18	21.48	261
6	4	16	16.25	254	6	18	26.09	261
7	4	16	20.39	255	6	18	30.30	261
8	4	16	24.53	255	6	18	34.51	260
9	4	16	29.09	255	6	18	39.11	260
10	4	16	33.24	256	6	18	43.31	260
11	4	16	37.41	257	6	18	47.51	260
12	4	16	41.57	257	6	18	52. 1	260
13	4	16	46.15	258	6	18	56.31	259
14	4	16	50.32	258	7	19	0.50	259
15	4	16	54.51	259	7	19	5.09	258
16	4	16	59.09		7	19	9.27	258
17	5	17	3.28	259	7	19	13.45	257
18	5	17	7 48	250	7	19	18.02	257
19	5	17	12.08	260	7	19	22.19	256
20	5	17	16.28	260	7	19	26.35	256
21	5	17	20.48	260	7	19	30.51	
22	5	17	25.09	250	7	19	35.06	255
23	5	17	29.30	261	7	19	39.21	255
24	5	17	33.51	261	7	19	43.35	254
25	5	17	38.12	261	7	19	47.48	253
26	5	17	42.33	261	7	19	52.01	253
27	5	17	46.55	262	7	19	56.13	252
28	5	17	51.17	262	8	20	00.25	252
29	5	17	55.38	262	8	20	4.36	251
30	6	18	0.00	262	8	20	8.45	250

A Table of the Suns Right Aſcenſion in Time.

	♌ H	♒ H	Com. parts ′ ″	diff. ″	♍ H	♓ H	Com. parts ′	diff.
1	8	20	12.55	249	10	22	12.13	228
2	8	20	17.04	248	10	22	16.01	228
3	8	20	21.12	248	10	22	19.49	227
4	8	20	25.20	247	10	22	23.36	227
5	8	20	29.27	246	10	22	27.23	226
6	8	20	33.33	245	10	22	31.09	226
7	8	20	37.38	244	10	22	34.55	225
8	8	20	41.42	244	10	22	38.40	225
9	8	20	45.46	244	10	22	42.25	225
10	8	20	49.50	243	10	22	46.10	224
11	8	20	53.53	242	10	22	49.54	224
12	8	20	57.55	240	10	22	53.38	223
13	9	21	1.55	240	10	22	57.21	223
14	9	21	5.55	239	11	23	1.24	223
15	9	21	9.54	239	11	23	4.47	222
16	9	21	13.53	238	11	23	8.29	222
17	9	21	17.51	237	11	23	12.11	222
18	9	21	21.48	237	11	23	15.13	221
19	9	21	25.45	236	11	23	19.34	221
20	9	21	29.41	235	11	23	23.15	221
21	9	21	33.36	234	11	23	26.56	221
22	9	21	37.30	234	11	23	30.37	221
23	9	21	41.24	233	11	23	34.18	221
24	9	21	45.17	233	11	23	37.59	220
25	9	21	49.10	232	11	23	41.39	220
26	9	21	53.02		11	23	45.19	220
27	9	21	56.53	231	11	23	48.59	220
28	10	22	0.44	231	11	23	52.39	220
29	10	22	4.34	230	11	23	56.20	220
30	10	22	8.24	230	12	24	00.00	220

A Table of the Longitudes, Latitudes, Right Aſcenſion, Declination of 100 *of the moſt Notable Stars for* Anno 1680, *with the Difference for every Ten Years.*

Mag	Names of the Stars	Longitude	Latitude
		° ′ ″	° ′ ″
2	In the head of Andr.	♈ 09.52.09	25.42.10 N
2	In her Girdle - -	♈ 25.54.06	25.58.30 N
2	In her Souther foot	♉ 09.44.50	27.47.10 N
1	In Aquar. Fomahont	♒ 29.19.49	20.59.40 S
3	In his right ſhoulder	♒ 28.55.03	10.42.15 N
3	In his left shoulder -	♒ 18.56.33	08.42.15 N
5	In his left hand - -	♒ 11.55.33	04.50.15 N
2	Bright ✳ in Aqui.vul.	♑ 27.15.23	29.20.40 N
4	1. Horn ♈ - - - -	♈ 28.42.33	07.08.00 N
4	2. Horn of ♈ - - -	♈ 29.23.33	08.28.30 N
3	Bright ✳ in Aries -	♉ 03.11.32	09.56.30 N
1	Capella - - - - - -	♊ 17.23.08	22.51.45 N
2	In his right shoulder	♊ 25.28.28	21.25.40 N
1	Boores Arcturus - -	♎ 19.47.32	31.00.40 N
3	In his left shoulder	♎ 14.13.33	49.51.40 N
nb	Cancer, Præſepe - -	♌ 02.51.29	01.14.30 N
4	Canc. the Nor. Aſell	♌ 03.01.59	03.08.30 N
4	The Southren Aſell.	♌ 04.12.59	00.03.30 N
1	The G. dog ✳ Sirius	♋ 09.47.53	39.32.05 S
2	The L. do. ✳ Precion	♋ 21.23.23	15.57.10 S
3	Capric. the fore horn	♑ 29.27.32	07 03.11 N
3	the lover horn	♑ 29.40.33	04.42.10 N
3	former in the tayl	♒ 17.23.33	02.24.50 S
3	latter in the tayl	♒ 19.09.33	02.27.50 S
3	Caſ. br. ✳ i'th' chair	♉ 00.38.53	51.17.50 N
3	Br g. ✳ in her Breaſt	♉ 03.22.33	46.36.50 N
3	In the bend of her hip	♉ 09.02.33	48.47.50
3	In her knee - - - - -	♉ 13.26.03	46.23.50
3	Cepheus in his Girdle	♉ 01.19.33	71.08.30
2	Cete the Whal's jaw	♉ 09.52.23	12.36.50 S
3	In the belly North -	♈ 17.31.21	20.17.20
3	The Nor. in the Tayl	♓ 25.29.53	09.58.10
2	The Southren - - -	♓ 28.02.53	30.43.40
2	Nor.Cr. the bright ✳	♏ 07.45.36	44.25.60 N

.asc. in d	r. aſ. in ti	Declinati.	di.r.a.	di.d.
° ′ ′	h ′ ″	° ′ ″	h′ ″	′ ″
357.58.44	23.51.55	27.20.38 N	0.31	03.24 A
12.54.44	0.51.39	33.56. 4 N	0.33	03.18 A
26.01.03	1.44.16	40.46. 0 N	0.35	03.18 A
339 54.00	22.39.36	31.14.10 S	0.34	03.00 S
327.20.55	21.49.24	1.49.32 S	0.22	02.54 S
318.39.42	21.14.39	6.53.58 S	0.32	01.36 S
307.30.42	20.30.03	10.37.32 S	0.30	01.51 S
293.47.23	19.35. 9	8. 3.56 N	0.14	01.18 A
24.00.36	1.36. 2	17.42.12 N	0.33	03.07 A
24.13.39	1.36.55	19.12.42 N	0.33	02.51 A
27.18.58	1.49.16	21.55.30 N	0.34	03.00 A
73.09.08	4.52.36	45.38.00 N	0.33	01.00 A
84.06.06	5.35.24	44.50.40 N	0.47	00.25 A
210.18.50	14. 1.15	20.53.55 N	0.28	02.57 S
214.50.09	14.19.21	39.10.36 N	0.25	02.41 S
125.28.26	8.21.54	20.46.52 N	03.5	01.54 S
126.08.00	8.24.32	22.35.00 N	0.36	02.00 S
126.36.32	8.26.25	19.19.00 N	0.35	01.00 S
97.43.42	6.30.55	16.17.18 S	0.27	00.24 A
110.38.32	7.22.34	6. 1.36 N	0.32	01.12 S
300.07.34	20. 0.30	13.25.18 S	0.34	01.36 S
300.50.05	20. 3.20	15.41.26 S	0.35	01.42 S
320.39.17	21.22.37	17.59.33 S	0.34	02.36 S
322 26.30	21.29.46	17.27.46 S	0.34	02.42 S
357.59.33	23.51.58	57.25.28 N	0.30	03.24 A
5.39.36	0.22.38	54.48.28 N	0.33	03.24 A
9.28.24	0.37.54	59. 0.48 N	0.34	03.24 A
16.17.00	1.05. 8	58.33.46 N	0.38	02.18 A
321. 2.06	21.24. 8	69.11.56 N	0.39	02.36 A
41.23.07	2.45.32	2.48.50 N	0.30	02.30 A
23.57.00	1.35.48	11.51.02 S	0.30	03.06 S
0.48.36	0. 3.14	10.31.50 S	0.31	03.30 S
6.59 44	0.27.59	19.42.32 S	0.31	03.24 S
230.26.00	15.21.44	27.49.32 N	1.26	02.06 S

A Table of the Longitudes, Latitudes, Right Aſcenſion, Declination of 100 of the moſt Notable Stars for Anno 1680, with the Difference for every Ten Years.

Mag.	Names of the Star.	Longitude	Latitude
		° ′ ″	° ′ ″
3	In the Swans bill -	♑ 26.48.37	49.03.00
3	In her Breaſt ——	♒ 20.28.37	57.10.20
3	In her tayl ——	♓ 00.58.18	59.57.20
3	In her upper wing	♒ 11.57.53	64.25.50
3	In her lower ——	♒ 23.14.22	49.27.00
3	Bright ✱ in Draco	♐ 23.29.13	75.02.10
2	Gemin.'s head of Ca	♋ 15.44.53	10.02.50
2	Gem. head of Pollux	♋ 18.47.59	06.38.30
2	In the bright foot	♋ 04.34.53	06.48.00
3	Hercules his head -	♐ 11.41.13	37.22.15
3	In his right ſhoulde	♏ 25.37.43	42.47.15
3	In his left shoulde	♐ 10.20.13	47.46.45
1	Hydr.'s Heart ——	♌ 22.49.43	22.23.50
1	Lyons Heart ——	♌ 25.31.48	00.26.20
1	Lyons Tyal ——	♍ 17.09.53	12.16.20
2	Ly. br. ✱ in his creſ	♌ 25.01.25	08.45.40
2	Ly. br. ✱ in his loin	♍ 05.50.38	14.18.30
3	Ly. i'th' top of 's neck	♌ 22.59.53	11.48.40
3	Ly. below in his neck	♌ 23.22.23	04.50.40
3	In the back o'th hare	♊ 15.12.13	43.55.50
2	Northern Ballance	♏ 14.55.23	08.33.30
2	Southern Ballance-	♏ 10.39.33	00.25.10
1	Bright ✱ i'th' harp	♑ 10.49.33	61.47.00
3	I'th' head of Ophius	♐ 18.00.13	35 56.15
3	In his left hand ——	♏ 27.54.43	17.18.20
3	In his right knee —	♐ 13.34.13	07.17.20
3	In his left knee—	♐ 04.49.13	11.29.20
3	In his right shoulder	♐ 20.55.13	28.00.20
4	Ori. i'th' top of his h	♊ 19.17.53	13.25.30
2	Orions right should	♊ 24.19.41	16.06.15
2	In his left shoulder -	♊ 16.29.53	16.52.30
1	Orions Foot Riged -	♊ 12.19.03	31.10.10
2	Firſt of his belt —	♊ 17.52.33	23.36.40
2	Second of his belt - -	♊ 18.55.48	24.34.10

ſc.in d.	r.aſ.in t.	Declinati.	di.r.a.	d.d.107.
° ′ ″	h ′ ″	° ′ ″	h ″	° ″
9.27.36	19.17.50	27.20.28 N	0.24	01.06 A
2.45.10	20.11.01	39.16.36 N	0.21	01.48 A
7.37.06	20.30.28	44.10.46 N	0.20	02.03 A
3.51.25	19.35.26	44.23.33 N	0.29	01.24 A
8.17.10	20.33.09	37.47.12 N	0.24	02.06 A
7.18.20	17.49.13	51.29.26 N	0.14	00.12 S
3.29.58	07.14.00	32.32.38 N	0.41	01.05 S
1.25.18	07.25.41	28.45.25 N	0.38	01.12 S
4.45.56	06.19.04	16.37.56 N	0.35	00.12 S
5.01.52	17.00.07	14.48.44 N	0.27	00.18 S
4.05.35	16.16.26	22.15.40 N	0.25	01.00 S
5.26.19	17.01.45	25.17.24 N	0.21	00.48 S
37.57.22	09.11.49	07.16.30 S	0.30	02.30 A
7.47.45	09.51.11	13.30.58 N	0.33	02.51 S
3.09.45	11.32.39	16.20.52 N	0.31	03.24 S
50.31.41	10.02.07	21.26.48 N	0.34	02.54 S
64.14.55	10.57.00	22.14.32 N	0.35	03.24 S
49.41.16	09.58.45	24.59.42 N	0.35	02.54 S
47.30.16	09.50.01	18.19.09 N	0.35	02.48 S
78.38.80	05.14.34	21.00.13 S	0.26	00.42 S
24.59.02	14.59.56	08.09.58 S	0.32	00.24 A
18.21.44	14.33.27	14.39.54 S	0.33	00.42 A
76.29.32	18.25.58	38.31.28 N	0.20	00.24 A
60.01.26	17.20.06	12.51.46 N	0.28	00.42 S
39.31.01	15.58.04	02.19.16 S	0.33	01.48 A
52.55.46	16.51.43	15.14.30 S	0.30	01.30 A
4.55.01	16.19.40	19.50.30 S	0.33	01.00 A
61.54.02	17.27.36	04.43.46 N	0.33	00.30 S
79.24.45	05.17.39	09.42.14 N	0.33	00.42 A
84.25.40	05.37.47	07.17.32 N	0.33	00.24 A
077.00.52	05.08.06	06.01.25 N	0.31	00.45 A
074.47.44	04.59.18	08.35.36 S	0.30	00.57 S
078.54.24	05.15.38	08.34.14 S	0.31	00.42 S
079.57.27	05.19.51	01.25.58 S	1.31	00.36 S

A Table of the Longitudes, Latitudes, Right Aſcenſion, Declination of 100 *of the moſt Notable Stars for* Anno 1680, *with the* Differences *for every Ten Years.*

Mag.	Names of the Stars	Longitude ° ′ ″	Latitude ° ′ ″
2	The 3d in Orions belt	♊20.06.03	25:21:10 S
3	Pegaſus in his mouth.	♒27.28.17	22 06 20N
2	In his thigh, sheat—	♓24.57.13	31 08 20N
2	Bright ✱ in the wing	♓19.02.43	19 24 50N
2	Br. ✱ i'th' lower w.	♈04.43.13	21:37:10N
2	Perſeus in his ſide---	♉27.17.01	30:05 50N
3	Caput Meduſæ———	♉21.49.03	22 22 40N
4	Southern ſiſh occiput	♓16.56.05	07:17:00N
3	Bright ✱ betwixt ♓	♈13.53.05	09 04 00 S
4	Sagittar. in his head	♑09.05.33	01:45:10N
1	Scorpions's heart——	♐05.18.33	04 25:30 S
2	In his forehead north	♏28.40.03	01 06:55N
3	In his forehe. middle	♏28.03.13	01.52.40 S
3	In his forehead South	♏18.28.53	05.20.40 S
2	Serpents neck br. ✱	♏17.33.53	25.33.50N
1	Bulls eye South ——-	♊05.18.36	05.30.50 S
2	Bulls Northern eye-	♊03.59.06	02.36.10 S
3	The low- of Hiades	♊01.17.08	05.46.20 S
2	His Northern horn-	♊18.05.53	05.20.40 S
3	His Southern horn -	♊20.18.53	02.13.30 S
3	Brighteſt of the 7✱	♉20.37.42	03.59.30N
1	Virgin Spike ———	♎19.22.53	01.59.30 S
3	Br. ✱ in her Girdle	♎07.01.53	08.40.30N
3	Vindimiatrix ———	♎05.28.23	16.15.00N
2	Great Bears shoulder	♌10.41.32	49.40.10N
2	Next under it———	♌14.51.03	45.05.40N
2	Br. ✱ hinder thigh	♌25.57.33	47.08.40N
3	Br. ✱ on his back	♌25.33.03	51.37.10N
2	In his Rump Aliot -	♍04.19.33	54.17.45N
2	Middle in the Tayl -	♍11.04.59	55.21.10N
2	Laſt in the Tayl——	♍22.20.13	54.24.10N
2	The Pole Star———	♊24.09.53	65.59.50N
2	Little Bears shoulder	♌08.28.12	72.48.40N

r.aſc.in d.	r.aſ in t.	Declinati.	di.r.a.	d.d 10y.
° ' "	h ' "	° ' "	h '	' '
81.03.12	05.24.13	02.09.20 S	0.30	00.30 S
222.12.00	21.28.48	08.27.02 N	0.31	02.36 A
342.06.12	22.48.25	25.22.09 N	0.29	03.09 A
342.13.08	22.48.52	13.29.29 N	0.30	03.09 A
350.12.12	23.56.49	13.25.05 N	0.20	03.24 A
015.04.42	03.00..9	48.39.42 N	0.35	02.35 A
041.53.18	02.47.33	39.41.30 N	0.39	02.30 A
345.08.40	23.00.35	01.33.26 N	0.39	03.18 A
025.22.38	01.45.30	01.13.00 N	0.32	03.00 A
275.47.37	18.39.10	22.24.24 S	0.47	00.48 S
242.29.04	16.09.56	25.36.42 S	0.37	01.36 A
236.40.51	15.46.43	18.49.48 S	0.35	01.54 A
235.19.35	15.43.06	21.37.40 S	0.35	02.00 A
223.48.31	15.39.54	25.05.42 S	0.39	02.06 A
320.90.00	15.28.36	07.20.24 N	0.30	02.05 S
064.24.16	04.17.37	15.50.10 N	0.34	01.30 A
062.26.48	04.09.37	18.33.52 N	0.34	01.42 A
060.22.35	04.01.30	14.49.02 N	0.34	01.42 A
076.31.54	05.06.07	28.20.38 N	0.39	00.48 A
079.37.18	05.18.29	20.57.22 N	0.36	00.12 A
052.09.49	03.28.39	23.03.36 N	0.35	02.05 A
197.05.57	13.08.28	09.27.00 S	0.31	03.15 A
189.54.46	12.39.39	05.09.42 N	0.31	05.24 S
191.36.56	12.46.27	12.41.34 N	0.31	03.18 S
160.56.52	10.43.47	63.28.26 N	0.40	03.12 S
160.32.55	10.42.11	58.05.25 N	0.39	03.12 S
174.06.58	11.36.27	55.30.06 N	0.33	03.12 S
179.12.01	11.39.28	58.47.06 N	0.32	05.12 S
189.54.08	12.39.36	57.43.24 N	0.27	03.18 S
197.42.26	13.10.50	56.37.16 N	0.25	03.12 S
203.41.25	13.34.46	50.57.08 N	0.24	03.06 S
009.14.10	00.36.57	87.36.03 N	0.46	02.24 A
222.40.05	14.50.40	75.38.00 N	0.01	00.15 A

A Table of Accounts.

	1 *farthing*	2 *farthings*	3 *farthings*
	li. ſh. d. q.	li. ſh. d. q.	li. ſh. d. q.
1	1	2	3
2	2	1.0	1.2
3	3	1.2	2.1
4	1.0	2.0	3.0
5	1.1	2.2	3.3
6	1.2	3.0	4.2
7	1.3	3. 2	5.1
8	2.0	4.0	6.0
9	2.1	4.2	6.3
10	2.2	5.0	7.2
20	5.0	10.0	1. 3.0
30	7.2	1. 3.0	1.10. 2
40	10.0	1. 8.0	2. 6.0
50	1. 0.2	2. 1.0	3. 1.2
60	1. 0.3	2. 6.0	3. 9.0
70	1. 5.2	2.11.0	4. 4.2
80	1. 8.0	3. 4.0	5. 0.0
90	1.10.2	3. 9.0	5. 7.2
100	2. 1.0	4. 2.0	6. 3.0
200	4. 2.0	8. 4.0	12. 6.0
300	6. 3.0	12. 6.0	18. 9.0
400	8. 4.0	16. 8.0	1. 5. 0.0
500	10. 5.0	1. 0.10.0	1.11. 3.0
600	12. 6.0	1. 5. 0.0	1.17. 6.0
700	14. 7.0	1. 9. 2.0	2. 3. 9.0
800	16. 8.0	1.13. 4.0	2.10. 0.0
900	18. 9.0	1.17. 6.0	2.16. 3.0
1000	1. 0.10.0	2. 1. 8.0	3. 2. 6.0
2000	2. 1. 8.0	4. 3. 4.0	6. 5. 0.0
5000	5. 4. 2.0	10. 8. 4.0	15.12. 6.0
10000	10. 8. 4.0	20.16. 8.0	31. 5.0

A Table of Accounts.

	1 penny	*2 pence*	*3 pence*	*4 pence*
	li. ſh. d.	li. ſh. d.	li. ſh. d.	li. ſh. d.
1	1	2	3	4
2	2	4	6	8
3	3	6	9	1. 0
4	4	8	1. 0	1. 4
5	5	10	1. 3	1. 8
6	6	1. 0	1. 6	2. 0
7	7	1. 2	1. 9	2. 4
8	8	1. 4	2. 0	2. 8
9	9	1. 6	2. 3	3. 0
10	10	1. 8	2. 6	3. 4
20	1. 8	3. 4	5. 0	6. 8
30	2. 6	5. 0	7. 6	10. 0
40	3. 4	6. 8	10. 0	13. 4
50	4. 2	8. 4	12. 6	16. 8
60	5. 0	10. 0	15. 0	1. 0. 0
70	5.10	11. 8	17. 6	1. 3. 4
80	6. 8	13. 4	1. 0. 0	1. 6. 8
90	7. 6	15. 0	1. 2. 6	1.10. 0
100	8. 4	16. 8	1. 5. 0	1.13. 4
200	16. 8	1. 13. 4	2.10. 0	3. 6. 8
300	1. 5. 0	2. 10. 0	3.15. 0	5. 0. 0
400	1. 13. 4	3. 6. 8	5. 0. 0	6.13. 4
500	2. 1. 8	4. 3. 4	6. 5. 0	8. 6. 8
600	2. 10. 0	5. 0. 0	7.10. 0	10. 0. 0
700	2. 18. 4	5. 16. 8	08.15. 0	11.13. 4
800	3. 6. 8	6. 13. 4	10. 0. 0	13. 6. 8
900	3. 15. 0	7. 10. 0	11. 5. 0	15. 0. 0
1000	4. 3. 4	8. 6. 8	12.01. 0	16.13. 4
2000	8. 6. 8	16. 13. 4	25. 0. 0	33. 6. 8
5000	20. 16. 8	41. 13. 4	62.10. 0	83. 6. 8
10000	41. 13. 4	83. 6. 8	125. 0. 0	166.13. 4

A Table of Accounts.

	5 pence	6 pence	7 pence	8 pence
	li. ſh. d.	li. ſh. d.	li. ſh. d.	li. ſh. d.
1	5	6	7	8
2	10	1. 0	1. 2	1. 4
3	1. 3	1. 6	1. 9	2. 0
4	1. 8	2. 0	2. 4	2. 8
5	2. 1	2. 6	2.11	3. 4
6	2. 6	3. 0	3. 6	4.
7	2.11	3. 6	4. 1	4:
8	3. 4	4. 0	4. 8	5.
9	3. 9	4. 6	5. 3	6.
10	4. 2	5. 0	5.10	6.
20	8. 4	10. 0	11. 8	13.
30	12. 6	15. 0	17. 6	1. 0.
40	16. 8	1. 0. 0	1. 3. 4	1. 6.
50	1. 0. 0	1. 5. 0	1. 9 2	1.13.
60	1. 5. 0	1.10. 0	1.12. 0	2. 0.
70	1. 9. 2	1.15. 0	2. 0.10	2. 6.
80	1.13. 4	2. 0. 0	2. 6. 8	2 13.
90	1.17. 6	2. 5. 0	2.12. 6	3. 0.
100	2. 1. 8	2.10. 0	2.18. 4	3. 6.
200	4. 3. 4	5. 0. 0	5.16. 8	6.13.
300	6. 5. 0	7.10. 0	8.15. 0	10. 0.
400	8. 6. 8	10. 0. 0	11.13. 4	13. 6.
500	10. 8. 4	12.10. 0	14 11. 8	16.13.
600	12.10. 0	15. 0. 0	17.10. 0	20. 0.
700	14.11. 8	17.10. 0	20. 8. 4	23. 6.
800	16.13. 4	20. 0. 0	23. 6. 8	26.13.
900	18.15. 0	22.10. 0	26. 5. 0	30.00.
1000	25.16. 8	25. 0. 0	29. 3. 4	33. 6.
2000	41.12. 4	50. 0. 0	58. 6. 8	66.13.
5000	104. 3. 4	125. 0. 0	145.16. 8	166.13.
10000	208. 6. 8	250. 0. 0	291.13. 4	333 6.

A Table of Accounts.

	9 *pence*	10. *pence*	11. *pence*	12. *pence*
	li. ſh. d.	li. ſh. d.	li. ſh. d.	li. ſh. d.
1	9	10	11	1. 0
2	1.6	1. 8	1.10	2. 0
3	2.3	2. 6	2. 9	3. 0
4	3.0	3. 4	3. 8	4. 0
5	3.9	4. 2	4. 7	5. 0
6	4.6	5. 0	5. 6	6. 0
7	5.3	5.10	6. 5	7. 0
8	6.0	6. 8	7. 4	8. 0
9	6.9	7. 6	8. 3	9. 0
10	7.6	8. 4	9. 2	10. 0
20	15 0	15. 8	18. 4	1. 0. 0
30	1. 2.6	1. 5. 0	1. 7. 6	1.10. 0
40	1.10.0	1.13. 4	1.16. 8	2. 0. 0
50	1.17.6	2. 1. 8	2. 5.10	2.10. 0
60	2. 5.0	2.10. 0	2.15. 0	3. 0. 0
70	2.12.6	2.18. 4	4. 4. 2	3.10. 0
80	3. 0.0	3. 6. 8	3.13. 4	4. 0. 0
90	3. 7.6	3.15. 0	4. 2. 6	4.10. 0
100	3.15. 0	4. 3. 4	4.11. 8	5. 0. 0
200	7.10. 0	8. 6. 8	9. 3. 4	10. 0. 0
300	11. 5. 0	12.10. 0	13.15. 0	15. 0. 0
400	15. 0. 0	16.13. 4	18. 6. 8	20. 0. 0
500	18.15. 0	20.16. 8	22.18. 4	25. 0. 0
600	22.10. 0	25. 0. 0	17.10. 0	30. 0. 0
700	26. 5. 0	29. 3. 4	32. 1. 8	35. 0. 0
800	30. 0. 0	33. 6. 8	36.13. 4	40. 0. 0
900	33.15. 0	37.10. 0	41. 5. 0	45. 0. 0
1000	37.10. 0	41.13. 4	45.16. 8	50. 0. 0
2000	75. 0. 0	83. 6. 8	91.13. 4	100. 0. 0
5000	187.10. 0	208. 6. 8	229. 3. 4	250. 0. 0
10000	375. 0. 0	416.13. 4	458. 6. 8	500. 0. 0

Forreign Weights and Meaſures, Carefully compared with the Engliſh.

	Engliſh Foot, into 1000 equal Parts.	Engliſh Foot, into Inc. and tenth parts of an Inch.	The Pound Averdupois into 100 parts.
London Foot	1000	0.12.0	100
France.			
Paris, the Royal Foot	1.06	1.00.8	0.93
Lyon Ell	3.976	3.11.7	1.09
Boloyn Ell	2. 76	2.00.8	0.89
The 17 *Provinces.*			
Amſterdam Foot	.942	0.11.3	0.93
Ell	2.269	2.03.2	
Antwerp Foot	.946	0.11.3	0.98
Ell	2.273	2.03.3	
Brill Foot	1.103	1.01.2	
Dort Foot	1.184	1.02.2	
Rynland or Leyden Foot	1.033	1.00.4	0.96
Ell	2.260	2.03.1	
Lorain Foot	.958	.11.4	0.98
Mechalin Foot	.919	.11.0	0.98
Middleburg Foot	.991	.11.9	0.98

Germany.	Thouſ parts.	F.I.p.	Aver. 100.p.
Strasbourge Foot	.920	0.11.0	0.93
Bremen Foot	.964	0.11.6	0.94
Cologn Foot	.954	0.11.4	0.97
Frankford ad Menam Foot	.948	.11.4	5.93
Ell	1.826	1. 9.9	
Hambrough Ell	1.905	1.10.8	
Lipſig Ell	2.260	2. 3.1	0.95
Lubick Ell	1.903	1. 9.8	1.17
Noremburg	1.006	1.00.1	
Ell	2.227	2. 3.3	0.94
Bavaria	.954	0.11.4	
Vienna	1.053	1.00.6	5.83
Spain and Portu.			
Spanish Palm, or the Palm of Caſtile.	.751	0.09.0	0.99
The Spãnish Vare or Rod, (four Palms)	3.004	3.00.0	
Their Foot is $\frac{1}{3}$ of the Vare	1.001	1.00.0	
Lisbon Vare	2.750	2.09.0	1.06
Gibralter Vare	2.760	2.09.1	1.03
Toledo Foot-	.899	0.10.7	1.00
Vare	2.685	2.08.2	
Italy.			
Roman Foot, on the Monum. of Coſſutius	.957	0.11.6	1.23
Of Statilius	.972	0.11.7	
Roman Palm, for building, whereof 10 make the Cauna	.732	0.08.8	

	Thou. parts.	F. In. p.	Aver. 100 p.
	1.204	1.20.4	1.27
Bononia Foot	2.147	2.01.7	
Ell			
Perch, whereof 500 to a Mile	12.040	12.00.5	
Florence Brace or Ell	1.913	1.11.0	1.23
Naples Palm	.861	0.09.6	1.43
Brace	2.100	2. 1.2	
Canna	6.880	6.10.5	
Genua Palm	.830	.09.6	1.42
Mantova Foot	1.569	1.06.8	1 43
Milan Calamus	6.544	6.06.5	1.40
Parma Cubit	1.866	1.10.4	1 43
Venise Foot	1.162	1.01.9	1.53
Other Places.			
Dantzick Foot	.944	0.11.3	1.19
Ell	1.903	1.10.8	
Copenhagen Foot	.965	.11.6	0.94
Prague (in Bohemia) Foot	1.026	1.00.3	1.06
Riga Foot	1.831	1.09.9	
China Cubit	1.016	1.00.2	
Turin Foot	1.062	1.00.7	
Cairo Cubit	1.824	1.09.9	1.61
Perſian Araſh	3.197	3.02.3	
Turkish Pike, at Conſtantin, the greater	2.200	1.02.4	0.86
The Greek Foot	1.007	1.00.1	
The Univerſal meaſure.	3.[illegible]67	3. 3.2	

A Pendulum *of the juſt length whereof will vibrate 60 times in a Minute.*

To Guage a Cask which is not full.

A Table for Guaging of Wine Casks which are not full.

G.	parts	G.	parts	G.	parts	G.	parts	G.	parts
0	000	13	2630	26	4330	39	5913	52	7072
$\frac{1}{2}$	295		2703		4400		5976		7758
	470	14	2775	27	4462	40	6040	53	7829
1	602		2847		4542		6094		7909
2	720	15	2918	28	4585	41	6158	54	7990
	830		2986		4646		6223		8072
3	935	16	3056	29	4726	42	6288	55	8154
	1038		3123		4766		6353		8236
4	1138	17	3189	30	4826	43	6418	56	8319
	1235		3255		4885		6483		8404
5	1339	18	3321	31	4943	44	6548	57	8491
	1420		3387		5000		6613		8580
6	1502	19	3452	32	5057	45	6679	58	8661
	1596		3517		5115		6745		8765
7	1681	20	3582	33	5174	46	6811	59	8862
	1764		3647		5234		6877		8962
8	1846	21	3712	34	5294	47	6944	60	9065
	1928		3777		5354		7012		9170
9	2010	22	3842	35	5415	48	7082	61	9280
	2091		3906		5476		7153		9398
10	2171	23	3960	36	5535	49	7225	62	9530
	2242		4024		5600		7297		9705
11	2328	24	4087	37	5662	50	7370	63	10000
	2405		4150		5724		7444		
12	2481	25	4213	38	5787	51	7519		
	2556		4270		5850		7595		

A Table of Meridional Parts.

Deg. Latit.	0	10	20	30	40	50	D
0	0	16	38	50	66	88	16.5
1	100	116	133	150	166	183	16.5
2	200	216	233	250	267	283	16.5
3	300	317	333	350	367	383	1.7
4	400	417	433	450	467	484	1.7
5	500	517	534	551	567	584	1.7
6	601	618	634	651	668	685	1.7
7	701	718	735	752	769	785	1.7
8	802	819	836	853	870	887	1.7
9	903	920	937	954	971	988	1.7
10	1005	1022	1039	1056	1082	1090	1.7
11	1107	1124	1141	1158	1185	1192	1.7
12	1209	1226	1243	1260	1287	1294	1.7
13	1311	1328	1345	1367	1380	1397	1.7
14	1414	1431	1448	1468	1483	1500	1.7
15	1517	1534	1552	1569	1586	1604	1.7
16	1621	1638	1656	1673	1690	1708	17.5
17	1725	1743	1760	1778	1795	1813	17.5
18	1830	1848	1865	1883	1900	1918	17.5
19	1936	1953	1971	1988	2006	2024	17.5
20	2042	2059	2077	2098	2113	2131	17.5
21	2148	2166	2184	2202	2220	2238	1.8
22	2256	2274	2292	2310	2328	2346	1.8
23	2364	2382	2400	2419	2437	2455	1.8
24	2473	2491	2510	2528	2545	2565	1.8
25	2583	2501	2620	2638	2657	2675	1.8
26	2694	2712	2731	2750	2768	2787	1.8
27	2806	2824	2843	2862	2880	2899	1.8
28	2918	2937	2956	2975	2994	3013	1.9
29	3032	2051	3070	3089	3108	3128	1.9

A Table of Meridional Parts.

Deg Lattit.	0	10	20	30	40	50	D
30	3147	3106	3185	3205	3224	3244	19
31	3263	3282	3302	3322	3341	3361	19
32	3380	3400	3420	3439	3459	3469	20
33	3499	3519	3539	3550	3579	3599	20
34	3619	3639	3659	3679	3700	3720	20
35	3740	3760	3781	3801	3822	3842	20
36	3863	3884	3904	3925	3946	3967	21
37	3987	4000	4029	4050	4071	4092	21
38	4114	4135	4156	4177	4198	4220	21
39	4241	4265	4284	4305	4327	4349	22
40	4371	4393	4414	4436	4458	4480	22
41	4502	4524	4546	4569	4591	4613	22
42	4636	4658	4681	4703	4726	4749	22
43	4771	4794	4817	4840	4863	4886	23
44	4909	4932	4956	4970	4002	4026	23
45	5050	5073	5097	5120	5144	5168	23
46	5192	5216	5040	5265	5289	5313	24
47	5337	5362	5386	5411	5436	5461	25
48	5485	5510	5585	5560	5586	5611	25
49	5636	5662	5687	5713	5739	5764	26
50	5790	5816	5842	5868	5895	5921	26
51	5948	5974	6001	6027	6054	6081	26
52	6108	6135	6162	6190	6217	6245	27
53	6272	6300	6328	6356	6384	6412	28
54	6440	6469	6497	6526	6555	6584	29
55	6613	6642	6671	6700	6730	6760	29
59	6790	6820	6850	6879	6910	6940	30
57	6970	7002	7031	7060	7094	7125	31
58	7156	7188	7220	7252	7184	7316	32
59	7348	7380	7413	7446	7479	2512	33

A Table of Meridional Parts.

Deg. Latit.	0	10	20	30	40	50	D
60	7545	7579	7612	7646	7650	7714	34
61	7748	7793	7817	7852	7887	7923	35
62	7958	7994	8029	8065	8102	8138	36
63	8175	8211	8248	8286	8323	8361	37
64	8399	8437	8475	8514	8553	8592	38
65	8631	8671	8710	8750	8791	8831	39
66	8872	8913	8950	8996	9038	9080	41
67	9123	9166	9221	9252	9296	9340	43
68	9384	9429	9474	9517	9565	9611	45
69	9557	9704	9751	9798	9846	9899	47
70	9943	9993	10041	10091	10141	10192	49
71	10242	10294	10346	10398	10450	10504	52
72	10558	10612	10666	10722	10777	10834	54
73	10890	10948	11005	11064	11123	11182	57
74	11242	11303	11365	11427	11989	11553	61
75	11617	11682	11747	11814	11881	11948	67
76	12016	12086	12156	12227	12299	12371	70
77	12445	12519	12595	12672	12749	12828	74
78	12907	12988	13070	13153	13237	13322	81
79	13409	13497	13586	13677	13765	13863	88
80	13958	14055	14153	14253	14355	14459	97
81	14565	14672	14782	14893	15007	15123	107
82	15242	15363	15487	15613	15242	15874	121
83	16009	16148	16289	16435	16584	16737	139
84	16894	17056	17222	17394	17570	17752	162
85	17940	18135	18336	18548	18761	18986	
86	19220	19464	19719	19986	20266	20560	
87	20870	21197	21545	21915	22310	22985	
88	23193	23692	24238	24842	25517	26282	
89	27165	28210	29488	31137	33460	37431	
90	Infin.						

FINIS.

~~Lat 52°. 40′. S. 9.782796~~
~~CS. 9.900433~~
~~T. 9.882363~~
~~CT. 10.117637~~
~~Sec. 10.099470~~
~~CSe: 10.217204~~
~~VS. 9.311498~~
~~CVS. 9.594999~~

		natural	Logarithm:
Lat 52°. 40′..	S.	7951208	9.9004331
	CS.	6064511	9.7827958
	T.	13111046	10.1176373
	CT	7627157	9.8823627
	Sec.	16489376	10.2172042
	C.Sec.	12576705	10.0995669
	VS.	3935489	9.5949987
	CVS.	2048792	9.3114979